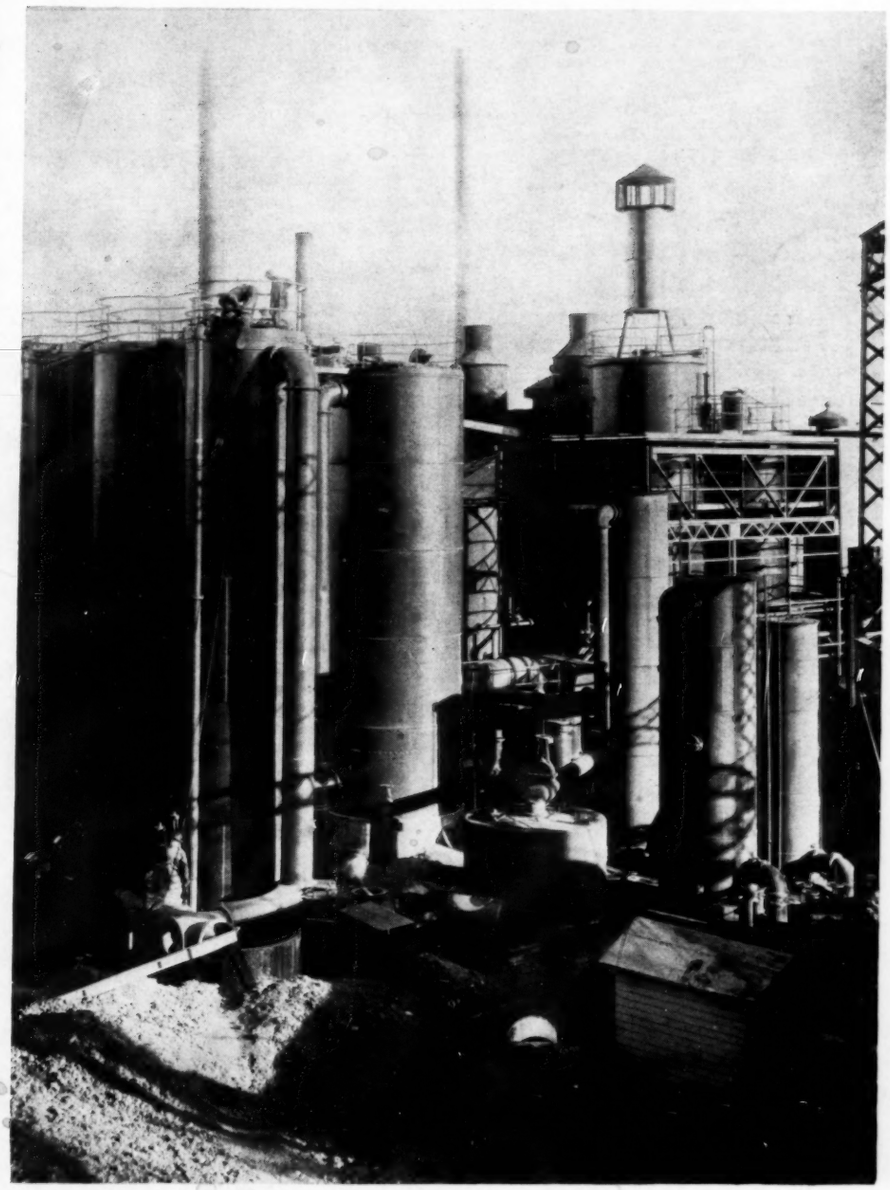
WESTERN GAS

ecember
1927

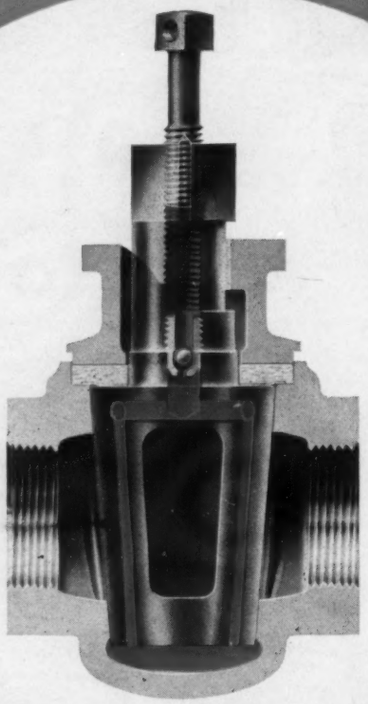


Installation of scrubbers at the Western States Gas and Electric Company's plant, recently added as a part of expansion program for gas in Stockton, Calif.

20 Cents
the Copy

DEC 27

A MONTHLY JOURNAL DEVOTED TO THE
WESTERN GAS & APPLIANCE INDUSTRIES



Guard Against Leaks

Merco Nordstrom Valve

Always tight—yet easy to turn on or off—that's an exclusive advantage of this *lubricated* valve. You don't have to fear leaks. The lubricated plug feature keeps the valves sealed against leaks. Hydraulic pressure can be increased around the plug merely by turning the screw at top of valve. Desirable in Gas Plants and on Gas Lines where valves are required. May we send catalog?

MERCO NORDSTROM VALVE CO.

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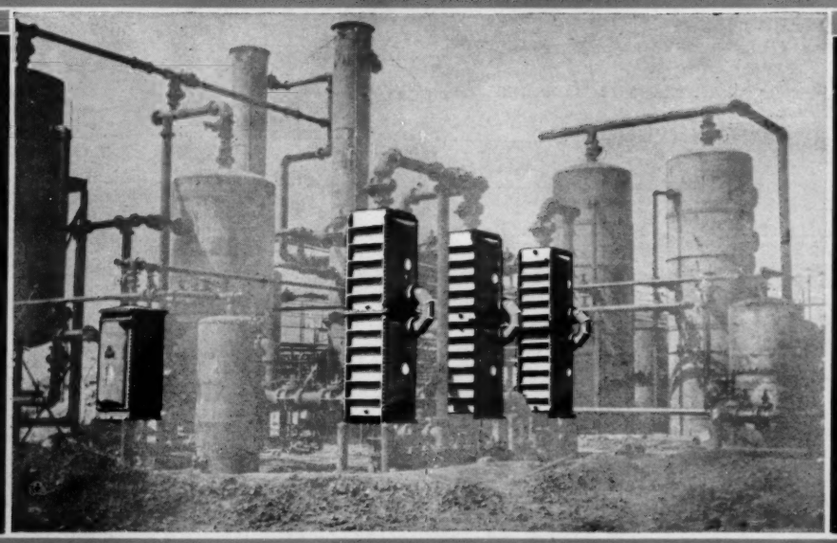

The heat transfer rate per square foot of surface is the economic factor and is due to the high velocities possible with turbulent flow and effective scrubbing of the tube surfaces.

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Official Publication Of The
Pacific Coast Gas Association

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6000 tons of Braun Heat Exchangers -

- manufactured during the last two years and *now* operating in refineries - and absorption plants, all over the world - - - - substantial evidence *that* BRAUN exchangers mean - - - - - - - - "Less cost per B·T·U transferred"

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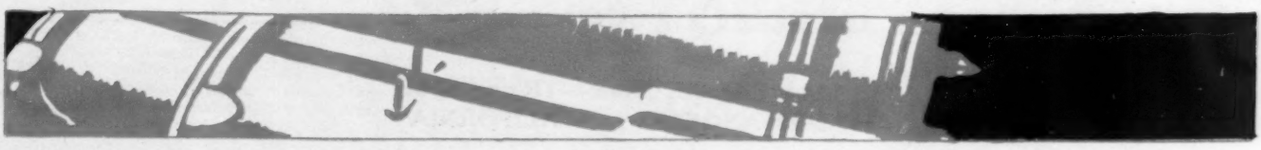

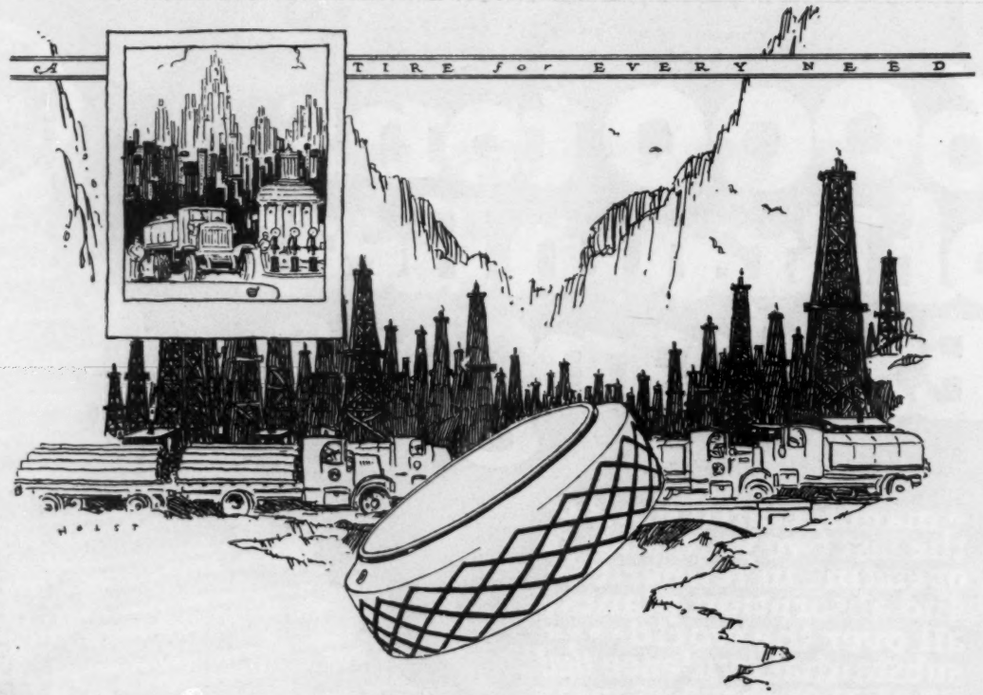

Heavy Duty Service

Would you like to have truck tires on those trucks of yours that you could forget about—no matter how punishing the route over which those trucks travel?

If you would—we suggest that you investigate the merits of the Goodyear Heavy Duty Cushion Tire with the famous All-Weather Tread. It's built for day-in-and-day-out service under which most trucks in the gas industry operate.

One of our representatives will be glad to call upon you any time you say and explain the merits of this particular tire. Incidentally—he'll be glad to analyze your hauling conditions and recommend just the right type Goodyears for your particular needs.

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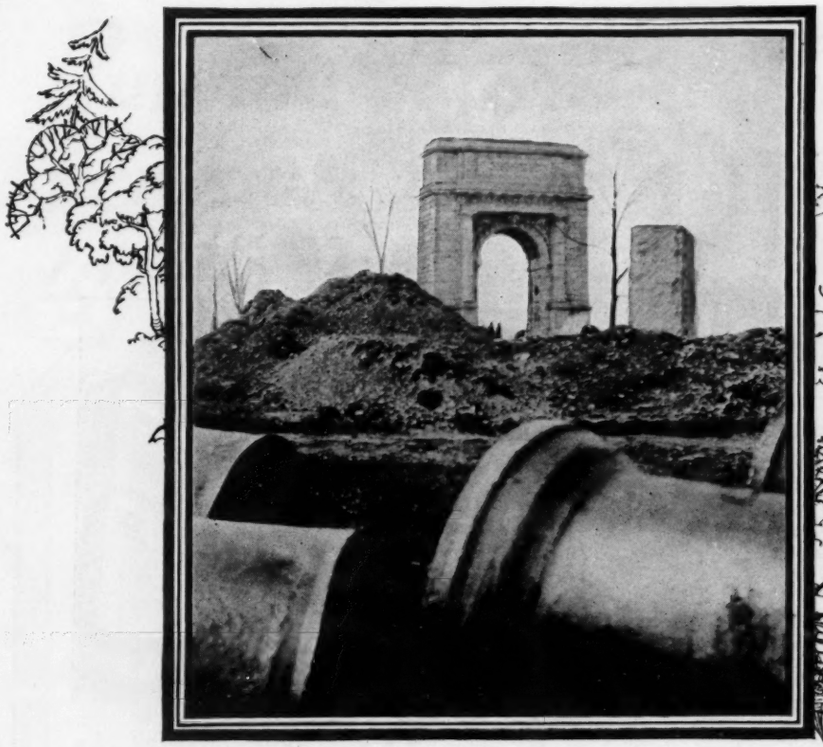

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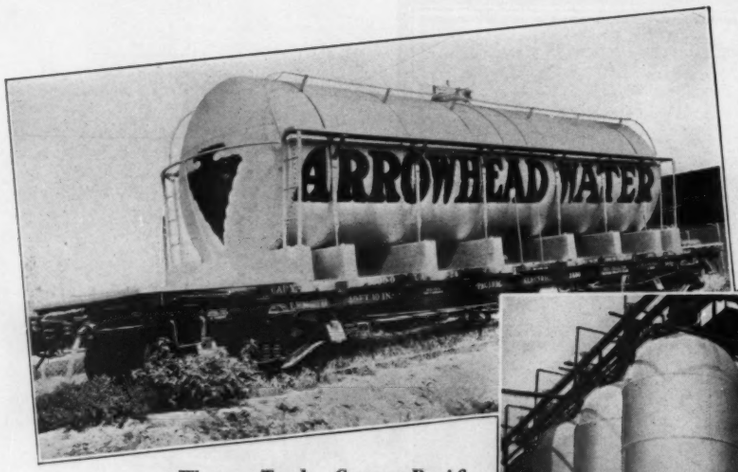
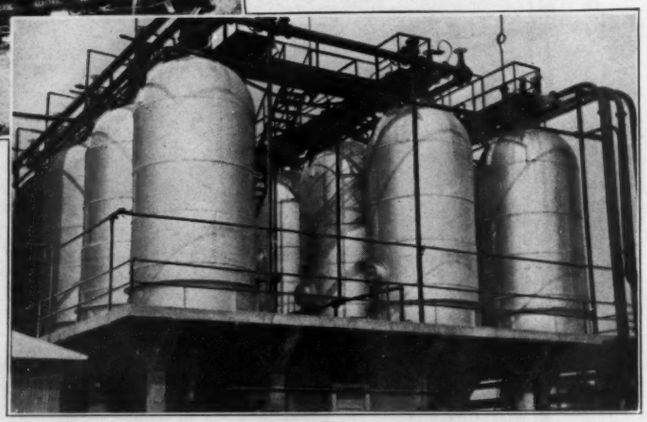


Water Tank Car — Pacific Electric Company, Los Angeles, California. 1 sprayed coat of Bitulumin



Gasoline Retorts — Associated Oil Company, Avon Refinery, California. 2 coats Bitulumin over 250 Iron Primer

SUNLIGHT AND MOISTURE CHIEF CAUSES OF EXPOSED METAL SURFACE BREAKDOWN

Bitulumin Deflects Harmful Ultra Violet Sunrays — Prevents Corrosion from Moisture Penetration— Minimizes Evaporation Through Keeping Tank Surfaces Cooler. For Many Other Purposes, Too

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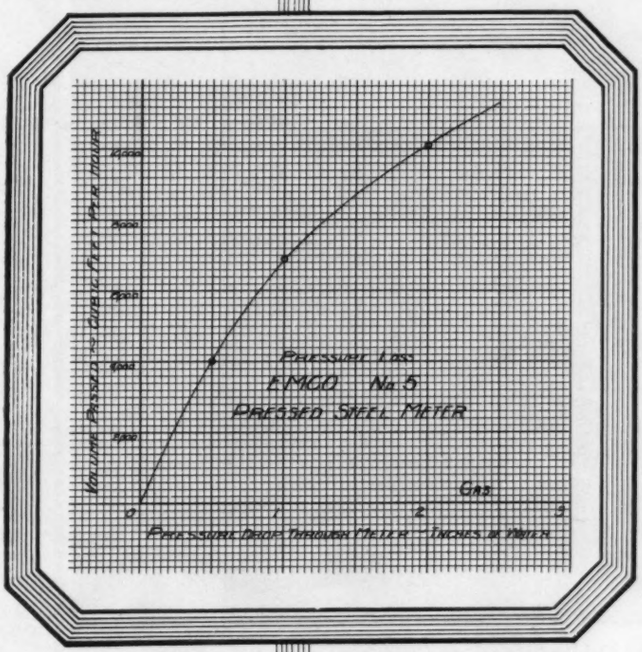

The EMCO No. 5 is a pressed steel meter. It is the most compact large capacity meter ever developed, requiring less than four feet of floor space.

Small as well as large volumes of gas are measured with accuracy.

The curve shown above is an actual test made on a No. 5 EMCO PRESSED STEEL METER and shows the pressure absorption through the meter expressed in inches of water, for various volumes. It will be seen that for the rated volume, 10,000 cubic feet per hour, the loss is less than 2 inches.

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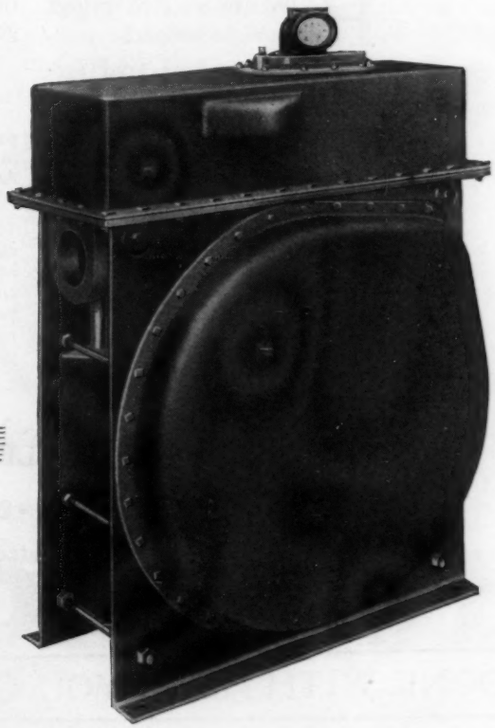
EMCO

ALSO METERS FOR MEASURING OIL, WATER, GASOLINE AND AIR and GAS REGULATORS



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Pittsburgh **Penna.**

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P·G·and E·

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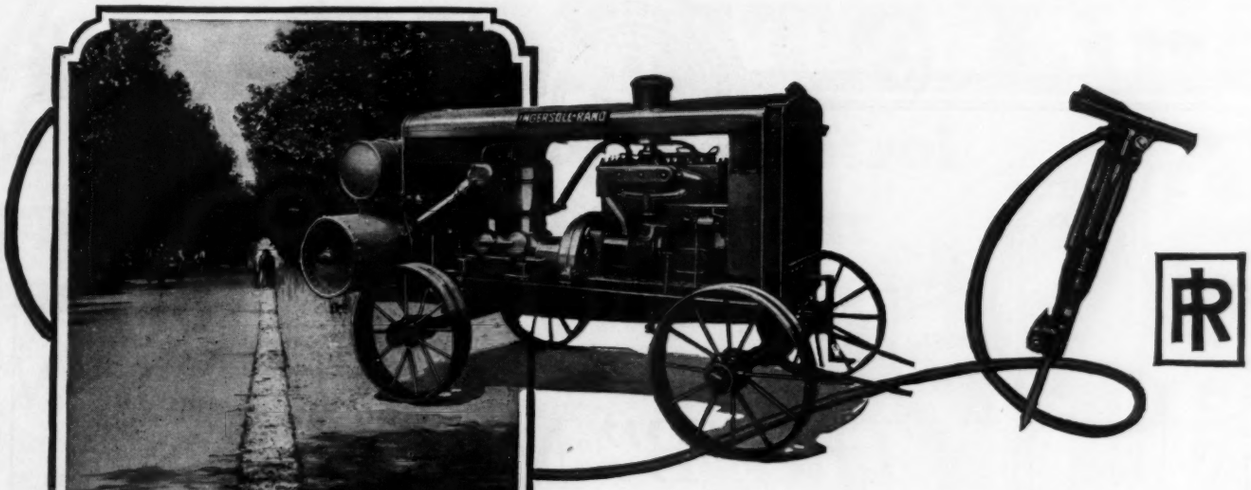
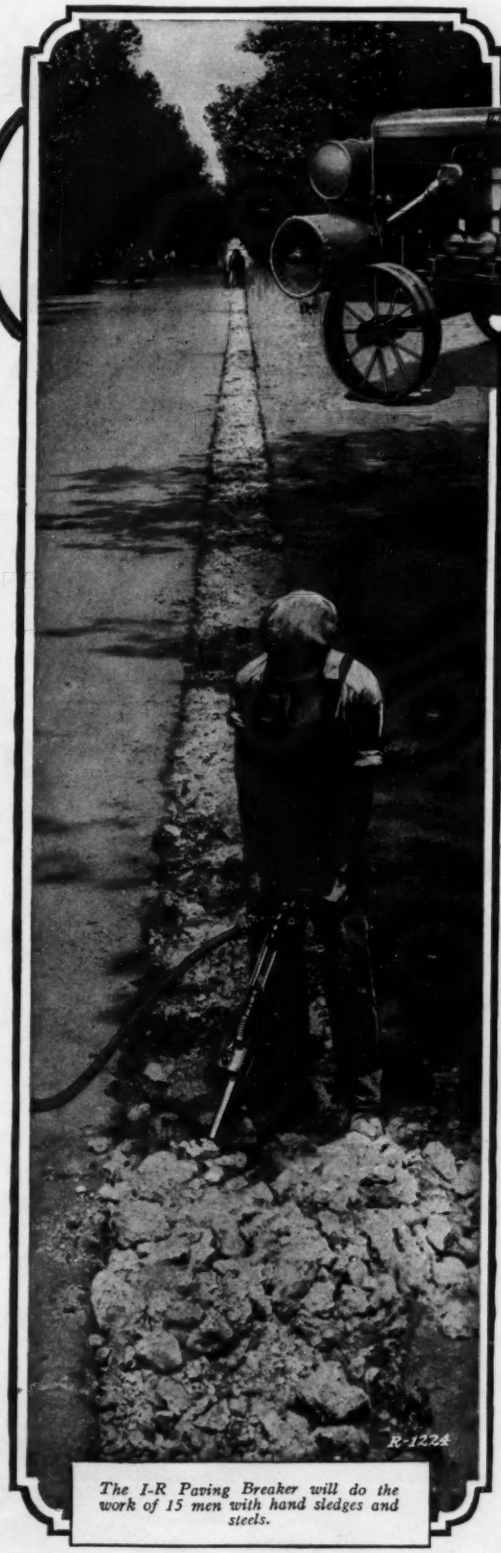
by Californians

IF IT'S DONE WITH HEAT YOU CAN DO IT BETTER WITH GAS



Time and labor savers—the Ingersoll-Rand Portable Compressor and Paving Breaker.



The I-R Paving Breaker will do the work of 15 men with hand sledges and steels.

This Outfit Paid for Itself in Two Weeks' Time

A WELL-KNOWN public utility company recently undertook a job that meant breaking out a strip of concrete paving and sidewalk almost a mile long. This figure must actually be doubled, since both sides of the street were torn up.

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The superintendent of the company, who was in constant touch with operations, states that the compressor and Paving Breakers paid for themselves on this one job alone.

You can make these savings, too. There is a compressor and a mounting for every type of work, and a complete line of air-operated, labor-saving tools. Upon request we shall be glad to send you full and authentic data showing how this equipment is reducing costs on other jobs in the field.

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WE carry a large stock of Davis, Crosby, Metric and accessory lines of measurement and control equipment to fill every gasoline plant requirement. Their proper application will minimize uncertainty in measuring and controlling Air, Gas, Steam, Water and Oil. Complete details and the co-operation of our engineers may be had for the asking.

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We Wish You
A Right Merry
Christmas
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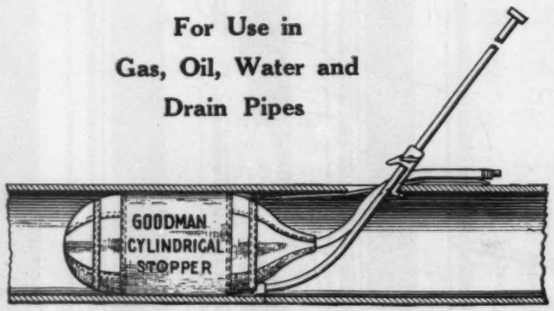
A Happy
Prosperous
New Year

For Use in
Gas, Oil, Water and
Drain Pipes



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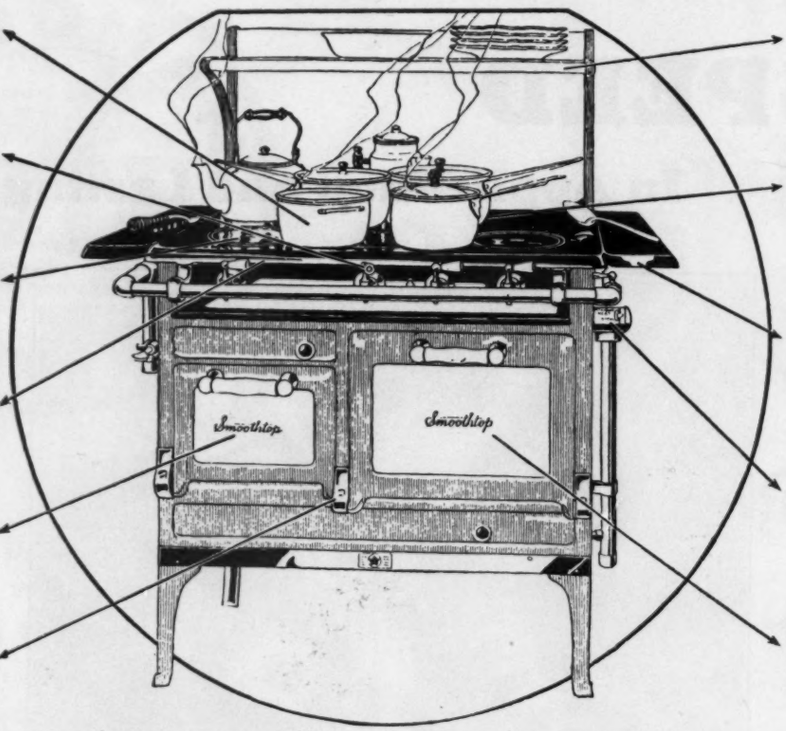
Cooks a whole meal over one burner.
Pilot light.
Each burner produces quick boiling, simmering and warming zones. Remove lids for quick cooking over direct flame.
Convenient height—38" from floor.
Well designed separate broiler.
Low oven—out of way—does not interfere with light. No rights or lefts.
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Cooking chart always at finger tips. Gives both time and temperature. Lists forty-two foods.
Standard Heat Control. Accurate, dependable, easily managed.
Exceptional baking results. Uniform distribution of heat throughout oven.
Smoothtop
Smoothtop

Give Women What They Want

MODERN WOMEN are looking for household equipment that will give them new conveniences to lighten their work, give them more time for leisure and improve their cooking. Smoothtop is the only range that **completely** fills these requirements.

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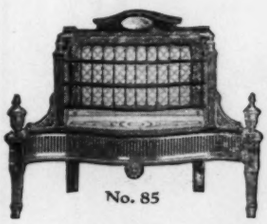
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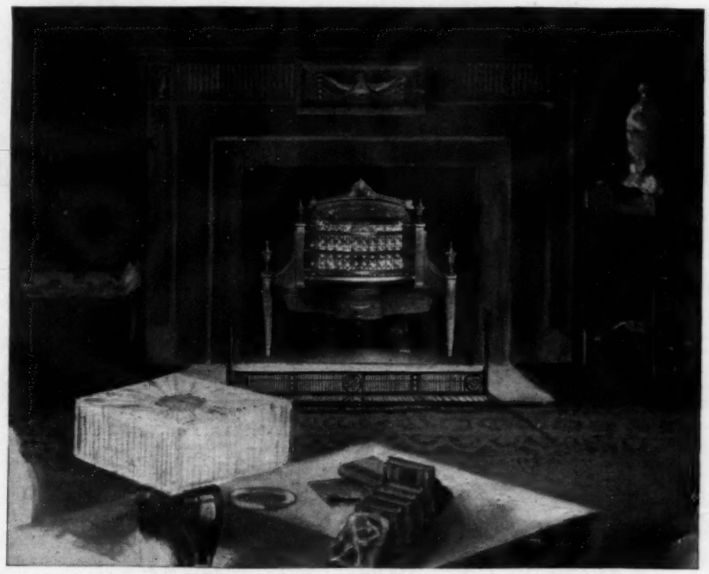

Santa Claus *Will* Buy Radiantfires

If radios are bought for Christmas (and they are); if furniture is bought for Christmas (and it is); if ranges, and washing machines, and other articles of utility are bought and given, then surely the Humphrey Radiantfire has a market at Yuletide . . . . For the Humphrey Radiantfire combines beauty and utility. It is a product that the whole family can enjoy; a piece of furniture in which the entire household can take pride. And the range of prices will fit the Christmas budget of any family.

Make this suggestion: A Humphrey Radiantfire for Christmas—and get *your* share of Christmas business.

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No. 115A

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The HUMPHREY

Radiantfire

TRADE MARK REG. U S PAT OFF

Manufactured by General Gas Light Co. Kalamazoo, Mich.

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"SUPERBO means HOT WATER"

Manufactured in Los Angeles since 1914

SUPERBO
AUTOMATIC
STORAGE
WATER HEATERS

SUPERBO "SAFETY"

"Blue TESTING LABORATORY AGA APPROVED *Star"*

Approval

First *in the* West *with the* Best

All Superbo "Safety" Heaters are equipped with Superbo "Safety Shut-off," protecting the user in case pilot light is extinguished or main gas supply is shut off.

Superbo "Safety" Heaters are equipped with either copper coil or steel cell heating units.

Superbo "Safety" Coil Type Heaters are equipped with Superbo "Reacting System," whereby internal circulating system of heater is flushed each time hot water is drawn.

Superbo "Safety" Heaters are equipped with an entire new type burner, constructed without screens, producing perfect combustion with any gas and positive against back-firing.

Manufactured by

SUPERBO MANUFACTURING CO.

Los Angeles, Calif.

No three numbers
ever sweetened a line so much

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Approved by the
A. G. A. TESTING LABORATORY
Approved by
GOOD HOUSEKEEPING INSTITUTE

Welsbach Radiant Heaters

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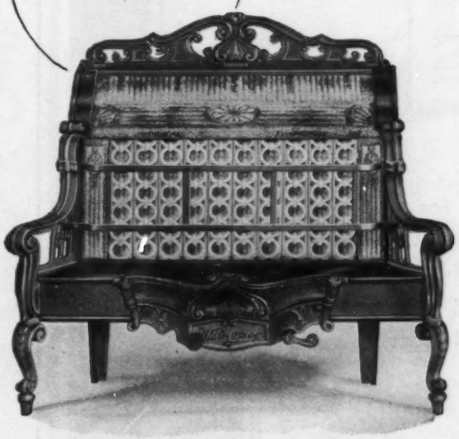
OFFICES IN PRINCIPAL CITIES

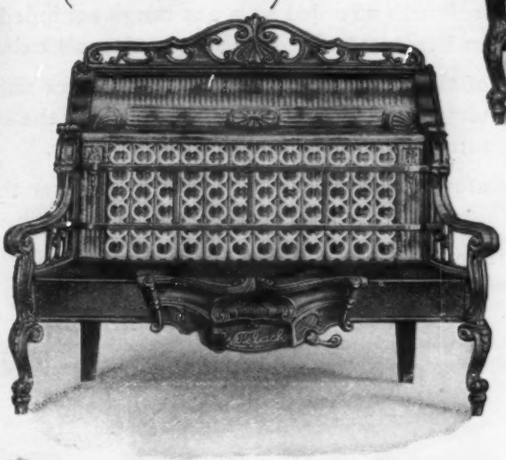
Members of American Gas Association
Members of Pacific Gas Association

$25



No. 47—Ten glowers. Finish: Silvered Brown. Columns beautifully tinted. Size: 23 inches high, 24 inches wide, 11½ inches deep.

$31.50



No. 49—Twelve glowers. Finish: Silvered Brown. Columns beautifully tinted. Size: 23 inches high, 28 inches wide, 11½ inches deep.

$16.50

No. 51—Seven glowers. Finish: Silvered Brown. Columns beautifully tinted. Size: 23 inches high, 20¼ inches wide, 11½ inches deep.

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DETROIT STOVE WORKS
LARGEST STOVE PLANT IN THE WORLD

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MAGEE

Monarch MALLEABLE

YORK ABENDROTH

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STOVES SUMMIT RANGES FURNACES
COMBINATION COAL AND GAS RANGES

PEERLESS

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Crawford Gas Ranges

ANDES

Paramount MALLEABLE

WHERE is the woman who does not yearn for the conveniences afforded by a gas range equipped with a modern oven heat control? She simply doesn't exist.

Think of the merchandising possibilities here and then follow the history of the Wilcolator which is today the standard oven heat control on over 90 makes of gas ranges.

Wilcolator on your gas range is a sales asset that builds increasing good will with years of service.

Ask us to send you Bulletin No. 204 for details.

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OVEN HEAT CONTROL

PRODUCT ...OR.. PRICE

WHICH IS MADE FIRST?

Today, as for the past 43 years, one definite policy guides the Roper organization in the pricing of its products. Every Roper Gas Range, every other appliance that is built in the Roper factory, is created to Roper's unswerving standards of quality—and priced afterward. Roper never has—and never will—allow quality to be sacrificed to price. Fortunately, for both retailer and consumer, the widespread and steadily increasing demand for Roper products makes possible a price level which is attractively low.

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GAS RANGES

GAS FURNACES

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What plant problems will be met in your 1928 budget:

Increased capacity?
Better yields?
Naphthalene removal?
De-Emulsification?
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Adjustment or re-design frequently accomplishes better results than are possible with new equipment. A discussion of your needs and problems with our engineers will not obligate you and may overcome troublesome plant conditions at important savings.

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WESTERN GAS

A Monthly Journal of the Gas, Gas Appliance and Natural Gasoline Industries in *Western America*

Present Status *of* Valuation *for* Rate Fixing

By T. J. RYAN
Valuation Engineer
Pacific Gas and Electric Company

SINCE utilities, like all other commercial enterprises, are subject to the immutable law of economics, the regulation of rates should be governed by economic principle, says Mr. Ryan, who read the present paper before the November regional session of the Pacific Coast Gas Association at San Francisco. Current indications, particularly in the light of the Supreme Court's Indianapolis Water case decision, are that value of service rendered will eventually bear a larger share in establishment of rates.

The author gives something of the background of rate regulation, and points out defects of the "historical" method of appraisal, which has been a thorn in the side of utilities for so long.—*Editor.*

REGULATION of prices by governmental authority is as old as government itself, and has, in past history, been far more extensive than today. The prices of farm products, foodstuffs, the wages of labor, the service rates of hotels, the charges made by messengers and guides, the fees of professional men, the tuition of private schools, and almost every other form or kind of commodity or service, have been subject to regulatory action in most civilized countries. The cumulative experience of all times has demonstrated that, except in times of calamity, prices will generally find a natural and normal level somewhere between the cost of production as a minimum and the value to the prospective customer as a maximum, and that any attempt to prescribe an arbitrary price is more likely to prove burdensome than beneficial, especially if, as has sometimes happened, the minimum limit of cost or the maximum limit of value, be ignored. As a result of this experience the more progressive countries gradually instituted, as a substitute for the precise fixing of prices, regulations designed to prevent extortion during unusual scarcity and discrimination at all times, and a rapid expansion of trade and an increase of prosperity followed, which confirmed the wisdom of the change.

The development of utility service during the past century has introduced into the commercial world an enormous volume of business in which the relationship of the interested parties is quite different from that to be found in transactions attending the free movement of commodities through the marts of trade. This difference is partly due to the monopolistic character of most utility service, and partly to the fact that the economic limits of prices—the cost minima and value maxima—are not so clearly marked or so readily recognized. Regulation of rates by state agency was, therefore, imperative. At first this took the form of prescribing, either by general state law or by stipulations of corporate charter or municipal franchise, the maximum legal charge that could be made, leaving the utility free to reduce or adjust that charge as conditions warranted. The subsequent development of the principle of state regulation to its present status is a matter of comparaively recent history.

We have, then, in its inception, an exercise of the power of the state in the regulation of rates primarily to prevent discrimination, and secondarily, to prescribe the fair value of the service. In the earliest of the regulatory enactments it was recognized that no utility could or should be required to charge less for its service than the cost of producing it. An important element of cost is the compensation the utility is entitled to receive for the use of property required for or devoted to the service it supplies, and this compensation is obviously proportionate to the value of the property. Appraisals of value were, consequently, when used in rate fixing proceedings, usually introduced by the utilities as part of the evidence designed to establish the cost of supplying service in order to define the minimum rates that could be endured by them without loss.

In a number of instances court proceedings were invoked to test the validity of rates prescribed by regulatory authorities on the grounds that the resultant revenues would be less than the cost of producing service. The decisions in these cases were accepted as defining the minimum limits of the authority of rate fixing bodies, and the policy of approaching these limits as closely as possible in the subsequent fixing of rates became quite general. Appraisals of property values, first used to demonstrate the minimum of possible rates, and later in proceedings instituted to test the validity of schedules prescribed by regulatory agencies, thus came into general use as an essential factor in rate fixing.

A more difficult phase of the situation developed in connection with the adjustment of industry to the conditions entailed by the disruption of economics and finance by the world war. With soaring prices in every kind of material and every form of labor, it was inevitable

that utility rates should require adjustment upward. Under the cost theory this adjustment was almost invariably compelled to wait until evidence, obtainable only by actual experience, was available to impress the regulatory commissions with the fact that rate increases were imperative. In considering measures of relief, however, the utility commissions found themselves confronted by an array of legal and technical talent employed by those interested in the continuation of low rates who have maintained and strenuously endeavored to establish a theory of appraisal that the utilities have generally characterized as contrary to the mandate of the law and the principles of equity.

This theory of appraisal (it has never been accorded the standing of a theory of value) is embodied in what is called the "Historical Method" of appraisal, or the "Prudent Investment" method of determining a rate base. It contemplates a rate base equal to the amount of money expended by the utility in the construction or acquisition of its property—not the total amount, but that portion which, in the judgment of the appraisers, had been wisely and prudently expended. The regulatory commissions throughout the country adopted this theory to such an extent that the courts were deluged with petitions for relief by utilities contesting the application of rate schedules based upon it, and sufficient decisions have now emerged from this welter of litigation to clarify the issues and settle the contested points.

AFTER repeatedly rejecting the "Historical" theory of appraisal in numerous other cases, the Supreme Court of the United States handed down a decision in the Indianapolis Water case that leaves no basis for doubt as to the plain meaning of the law governing the value of property in utility rate proceedings. The issue in this case was the legality of a schedule of rates fixed by the Indiana Public Service Commission for water service in the city of Indianapolis. The Water Company claimed that the revenues to be derived from these rates would be inadequate to provide a fair return on the value of the Company's utility property. The Commission had appraised the property on the basis of an average of prices during the ten-year period ending Dec. 31, 1921, with subsequent additions and betterments at actual cost. The Court ruled that this was not a proper basis of values, that present prices and an intelligent forecast of future trends were also necessary considerations, and that the earnings of the Company under the proposed rates would not be sufficient to provide a fair return on the value of the property appraised in the light of present day and prospective future prices. The action of the Commission was, therefore, declared to be confiscatory and void. It must be understood that these proceedings were not instituted for the purpose of fixing rates, but to determine the validity of rates that had already been fixed by the Commission. The issue the Supreme Court had to decide was whether the contested schedules would produce sufficient revenue to provide just compensation for the use of property devoted to water service, and in deciding that issue the Court rejected the "Historical" appraisal as a fair basis for compensation, and approved the findings of the lower court, which were based upon reproduction cost. It may be accepted as final that future cases involving the same issue will be decided in accordance with the same principles.

THE "Historical Method of Appraisal" has been condemned by the preponderance of expert judgment, and being now banned by court decision, deserves none of our respect and but little of our attention. It might be well, however, to give some consideration to its more manifest defects. Primarily, it is, in effect, an attempt to fix values by arbitrary mandate instead of endeavoring to ascertain them through an application of the principles of economics. It presumes to establish the original price paid for an article as its permanent value in utility service, irrespective of subsequent changes in price levels. On this account its proponents claim for it the merit of ensuring a degree of stability in property values underlying utility securities, and thus safeguarding investments, while at the same time protecting rate schedules from frequent adjustments to conform to temporary price fluctuations. The plausibility of these claims has caused many people to overlook the impossibility of realizing them.

This, perhaps, may be more readily explained by an illustration. Let us suppose that a building was erected in 1915 at a cost of ten thousand dollars, and another exactly like it in 1920, which cost fifteen thousand dollars. In the common understanding, the owner of these two structures would regard them as having practically the same value, the only difference being the greater depreciation of the older one. His banker would lend practically the same amount of money on the security of either. The insurance Company would assume practically the same risk for either, and in case of destruction by fire, would pay the same amount for the loss. The state, as represented by the tax assessor, would place the same value on both, and collect the same taxes. If the owner were to offer them for sale or lease, the prospective purchaser or tenant would recognize the same economic law. All of these considerations would be based upon the cost of reproducing these buildings at the prevailing levels of construction costs. But the "Prudent Investment" advocate asserts that one of these buildings has a "value" of only two-thirds that of the other, and, if rental rates were regulated, must be leased for a proportionately lower price. He says, in justification, that if, and when, prices go down to the 1915 levels, he will continue to recognize the cost of the building erected in 1920 as its value, and thus stabilize both earnings and investment.

NOW, suppose prices do go back to the old levels, what will result? In the first place, the banker will no longer accept the cost of the second building as a basis for a loan, but will reduce it to the cost of reproduction. The insurance company will no longer carry it as a $15,000 risk, but will reduce it to $10,000, and if a $15,000 policy is carried will pay only $10,000 in the event of its destruction by fire, because it can be replaced for that sum. A prospective purchaser will refuse to pay $15,000 for it, because he can have one built exactly like it for $10,000. And the prospective tenant will refuse to lease it at a rental proportionate to its cost, because other buildings will be available for a lower rate, or he can build one for himself and save the difference. The tax assessor will adjust his assessment to the cost of reproduction. It would be of no possible practical benefit to the owner for a regulatory commission to fix a rental rate based upon the original cost of the building because no tenant would pay it. However willing the Commission might be to "protect" such an investment, it would be wholly without power to do so, and any such attempt would only result in the loss of all income through the vacancy of the premises.

The "Historical Method" is, therefore, merely a yardstick of value that can only be used when it produces a lower figure than either the common understanding, the plain mandate of the law, the basic principles of equity, the state through its tax assessment, the banker and the insurance company unanimously confirm as the true value of a property. It will be wholly ineffective when it results in a figure in excess of value as represented by prices then prevailing, because it is beyond the power of any governmental agency to create or enhance value by the mandate of its decree.

Inasmuch as neither the "Historical Method" of appraisal nor the "Prudent

(Continued on Page 71)

These men, organized in teams of ten, have been bringing satisfaction to gas users on lines of Los Angeles Gas and Electric Corporation in a house-to-house appliance servicing campaign conducted by that utility's gas distribution department

Adjusting Domestic Gas Appliances *for* Natural Gas Service

By W. M. HENDERSON
Superintendent of Gas Distribution
Los Angeles Gas and Electric Corp.

WITH the introduction of straight natural gas to the distribution system of the Los Angeles Gas and Electric Corporation, some rather interesting problems developed. One which had an important bearing on the service rendered the consumer, was the task of adjusting gas appliances to properly burn a gas of different characteristics and a higher B.t.u. value.

Prior to March, 1927, the gas served was mixed gas, composed of natural gas and oil gas or reformed natural gas. This gas had a value of 850 B.t.u. and approximately .65 specific gravity, with a comparatively uniform composition approximating the following:

Carbon Dioxide	(CO_2)	5.7
Illuminants	(C_nH_{2n})	.8
Oxygen	(O_2)	.5
Carbon Monoxide	(CO)	4.6
Hydrogen	(H_2)	15.9
Ethane	(C_2H_6)	8.3
Methane	(CH_4)	61.6
Nitrogen	(N_2)	2.6
B.t.u. calculated		851
Specific Gravity		.643
Composition		55.91 per cent Natural 44.09 per cent Reformed

A typical analysis of the natural gas now distributed is:

Carbon Dioxide	(CO_2)	1.6
Illuminants	(C_nH_{2n})	.2
Oxygen	(O_2)	.2
Ethane	(C_2H_6)	19.8
Methane	(CH_4)	76.4
Nitrogen	(N_2)	1.8
B.t.u. Calorimeter		1130
Specific Gravity		.653

In comparing the two gases it will be noticed that the B.t.u. changed, the constituents varied in per cent, and the spe-

TABLE I—SUMMARY OF HOUSE TO HOUSE GAS APPLIANCE ADJUSTMENT WORK
LOS ANGELES GAS AND ELECTRIC CORPORATION
TOTALS AS OF OCTOBER 31, 1927

	Team No. 1 Pico and Close-in Southwest District	Team No. 2 Hollywood	Team No. 3 Inglewood and Southwest District	Team No. 4 Eagle Rock Annandale Garvanza	Total Los Angeles District	Pasadena (Completed)	Alhambra (Completed)	Grand Total
Premises Completed	34,001	30,657	20,901	9,790	95,349	25,899	11,051	132,299
Premises Called at, not at Home	10,943	8,200	6,211	3,014	23,368	8,455	3,999	35,822
Appliances Adjusted								
Ranges	27,633	23,631	16,682	7,702	75,648	15,882	6,814	98,344
Water Heaters	6,290	3,313	5,496	3,185	18,284	6,490	3,336	28,110
Space Heaters	13,413	13,227	4,874	3,095	34,609	4,708	2,345	41,662
Furnaces	145	65	1	10	211	462	37	710
Total Appliances Adjusted	47,481	40,236	27,060	14,044	128,821	27,542	12,532	168,895
Men in Field, Man-days Worked	1,840	1,541	998	618	4,997	1,000	447	6,444
Unsatisfactory Appliances								
Worn Out	872	454	478	293	2,097	266	145	2,508
Broken Parts	1,384	923	648	366	3,321	184	22	3,527
Thermostat	222	166	86	48	522	40	1	563
Vent	495	490	1,247	270	2,502	317	608	3,427
Ovens	250	103	117	39	509	100	20	629
Adjustment Referred to Agent	2,238	2,105	1,021	902	6,266	716	341	7,323
Total	5,461	4,241	3,597	1,918	15,217	1,623	1,137	17,977
Service Satisfactory	22,848	21,972	11,238	4,815	60,871	17,178	7,071	85,120
Service Unsatisfactory before Adjustment	9,735	7,149	8,006	3,886	28,776	8,721	3,980	41,477
Consumer's Attitude								
Friendly	30,461	2,793	18,621	9,010	85,885	25,498	10,844	122,227
Unfriendly	559	413	283	46	1,301	94	84	1,479
Indifferent	577	337	192	20	1,126	106	57	1,289
Unknown	1,049	359	160	38	1,606	298	66	1,970

cific gravity remained nominally the same. This situation required a change in adjustment on gas burners to secure efficient and proper combustion. Each factor played a part; the specific gravity showed little if any variation, for under the standard pressure of 7 inches the volume of gas passed by a given burner orifice remained the same.

THE ADJUSTMENTS REQUIRED

To secure satisfactory adjustment of the gas appliance burner to suit natural gas requires the admission of a greater volume of primary air. This is accomplished either by opening the air shutter or by reducing the gas volume, or by both adjustments. The usual procedure is to pein the orifice in the burner mixing tube, and thus cut somewhat the volume of gas, and increase its velocity. This increased velocity will tend to entrain more secondary air. With a higher B.t.u. value less gas is required to accomplish the same work, so the reduction in orifice size is advisable. Adjustable orifices are convenient to handle, removable orifices are easy to replace, but the greater number of appliances are fixed orifices and these must be peined and reamed to size.

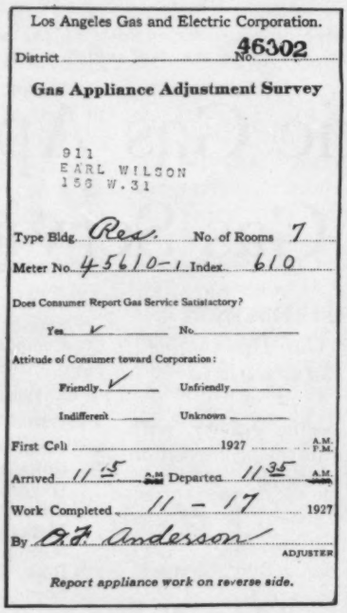
Natural gas is slow burning, and its rate of flame propagation is low. If the orifices on the surface of the burner head are small there is a tendency for the burning gas to leave the tips of the burner. This can only be overcome by enlarging the holes on the burner.

Shortly after natural gas was served to the consumers, complaints were received to the effect that the gas smoked and pot bottoms were blackened. Complaints from this source increased and it taxed the shop organization to meet the demand for adjustment service. The record disclosed the fact that all domestic appliances, water heaters, gas ranges and space heaters, required more or less adjustment. In view of this it was deemed advisable to organize a group of appliance adjusters to make a house to house visit, and inspect and adjust all gas burning equipment.

SERVICE CREWS ORGANIZED

Starting April 5th, 1927, with five experienced appliance men, a house-to-house survey was inaugurated. There are now in the field five teams of ten men each, with a captain in charge of each team. A team is assigned to a particular district of the city. Up to October 31st these special appliance adjusters had covered 45 square miles of area and visited 132,299 consumers. The supervision and direction of the work is in the hands of a chief inspector who is responsible to the foreman of the gas shop operations. Two clerks are employed to handle the orders and keep a check on the work performed.

A special work tag form is issued for each premises, a copy of which is illustrated. These are run through the addressograph to give the house number of consumers, and routed in the same order as the meter books. A manual, or instruction sheet, has been issued to each appliance adjuster explaining the procedure he is to follow, and the record he must keep on the work tag. This manual is of interest and will be published complete in *Western Gas* for January, 1928.

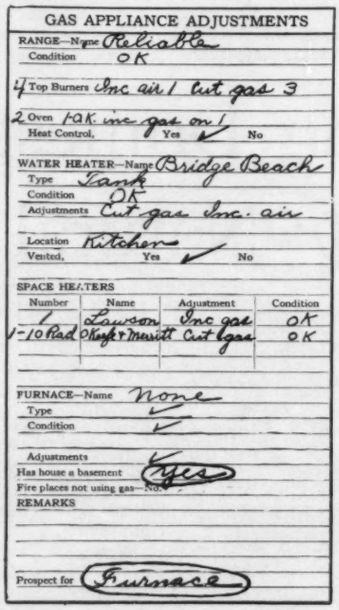


Los Angeles Gas and Electric Corporation.
District ..... No. 46302
Gas Appliance Adjustment Survey

911
EARL WILSON
156 W. 31

Type Bldg. Res. No. of Rooms 7
Meter No. 45610-1 Index 610
Does Consumer Report Gas Service Satisfactory?
Yes ✓ No .....
Attitude of Consumer toward Corporation:
Friendly ✓ Unfriendly .....
Indifferent ..... Unknown .....
First Call ..... 1927 ..... A.M. P.M.
Arrived 11 15 A.M. Departed 11 35 A.M.
Work Completed 11 - 17 1927
By O.F. Anderson ADJUSTER
Report appliance work on reverse side.

Front side of work tag form used by service crews



GAS APPLIANCE ADJUSTMENTS
RANGE—Name Reliable
Condition OK
4 Top Burners Inc air / Cut gas 3
2 Oven OK inc gas on /
Heat Control, Yes ✓ No
WATER HEATER—Name Bridge Beach
Type Tank
Condition OK
Adjustments Cut gas Inc. air
Location Kitchen
Vented, Yes ✓ No
SPACE HEATERS

Number	Name	Adjustment	Condition
1	Lawson	Inc gas	OK
1-10 Rad	Kipp & Merritt	Cut gas	OK

FURNACE—Name None
Type ✓
Condition ✓
Adjustments .....
Has house a basement Yes
Fire places not using gas—No. .....
REMARKS .....
Prospect for Furnace

Back side of same form; circled items appeared in red

The data gathered from the work tags tells a very interesting story, and indicates the need for such a complete adjustment service as undertaken. The recapitulation of the results to October 31st, 1927, is shown on Table I.

After seven months of operation, the field organization, the compilation of records, and the procedure have been reduced to an efficient plan. Some points of interest in this respect are worthy of mention.

A team consisting of ten men and a captain operate in a section of the city. Field headquarters are established where all men report in the morning, at noon, and on completion of the day's work. These headquarters are changed to convenient locations as the crew moves through the district. The captain is able to keep close check on the work by the constant contact with the men.

TEAM CAPTAIN'S WORK

The team captain checks the completed work each night and makes up new routes for the adjusters. Any difficulties encountered by the men receive the attention of the captain. Where the men fail to gain admission to the premises the captain follows up and makes every effort to complete the call.

At premises where there is no one at home, the men leave a card requesting a 'phone call to the office, and the fixing of a time for the man to call. The captain receives these daily and either cares for them himself or details one of the adjusters. The captain follows the practice of calling back on a few of each man's jobs to check the quality of work.

One man in each crew is equipped to take care of restaurant and industrial equipment, and any special adjustments that are required. As a general rule it is not the practice to adjust furnaces, automatic water heaters, thermostatic control of appliances or oven heat regulators;—these are best left to the manufacturer's agent or dealer, and the consumer is so advised.

To ranges, space heaters and water heaters, the adjuster gives his attention, and endeavors to secure a perfect adjustment of the gas burner.

From experience it has been found that the orifices on most burners require a reduction in size in order to secure gas velocity to entrain the increased volume of air necessary for proper combustion.

ORIFICE SIZES

The size of orifice to meet the conditions has been determined by experiment and observation. Operating with a 7-inch pressure, the following orifice sizes meet the requirements:

Ranges
Small burner.....No. 56 Morse Drill
Giant burner .....No. 54 Morse Drill
Tank Water Heaters
or Storage Type adjustable orifice .....No. 40 Morse Drill
Radiant Fires
7 Radiant .....No. 52 Morse Drill
10 Radiant .....No. 48 Morse Drill
Eight cross bars on burner tips.

Practically all appliances require some adjustment. Later models and the better class of appliances are quite easy to place in adjustment. The greatest difficulty is had with worn out

(Continued on Page 61)

Pacific Gas and Electric Company believes in safety education. The men in the view to the right comprise the company's San Rafael gas department safety team, winners in the safety contest held by the Pacific Coast Gas Association at Santa Cruz, and more recently victors in the 25-team contest at the Pacific Coast Safety Conference, at Los Angeles, October 24 to 28. Incidentally, the P. G. and E. men have the distinction of being the first utility team to take first honors in this annual Pacific Coast safety competition.

Solving *the* Human Equation *in* Accident Prevention

By S. C. DICKINSON

Safety Engineer, Pacific Gas and Electric Company

A Company Rule

¶ RULE NO. 8, FOR EMPLOYEES ENGAGED IN GAS CONSTRUCTION AND OPERATION—"When working in a manhole or regulator pit that requires the use of a gas mask, or where harmful gases are suspected, a rope must be attached to the body of the workman in the manhole and an attendant stationed above so that the worker can be drawn to the surface in case of necessity. Work of this character must be done only when expressly ordered by the foreman or superintendent in charge and under his direct supervision."

¶ RULE 204-c—"Never work on a leaky gas main or do work on mains or services in which gas must be allowed to escape unless properly protected by wearing a gas mask . . ."

An Accident

¶ From an accident report: "The injured was standing guard over a regulator pit. Two other men were in the pit loosening, oiling and tightening valve bolts, one at a time, preparatory to changing the valve at midnight. After finishing this work it was noted that a by-pass would have to be removed. Without instructions and in violation of the two rules stated above, the by-pass was disconnected; and before the escaping gas could be plugged off, the two men in the pit were overcome.

¶ "With the assistance of several passers-by, the attendant guarding the hole was able to bring the two to the surface. They were quickly rushed to the hospital where they remained overnight and returned to work the next day. However, the attendant, on attempting to come out of the pit, lost consciousness and fell back in, fracturing his skull on a small stop cock, and died instantly.'"

EVERY worker in the gas utilities may be expected to know something of the hazards of his profession, such as those which prompted the rule quoted above. Yet all too frequently the violation of these sane precautionary rules comes to general notice in an account of the fatal or near-fatal consequences to workmen involved.

Why do employees violate or disregard these safety measures—rules every word of which has been dictated by bitter experience, in the loss of lives and the destruction of property?

Do men violate such rules because they are ignorant of them? Do men cause accidents because they are careless, thoughtless or indifferent? Do men get injured because of the age-old saying that "accidents are bound to happen?" Or do they get injured because they do not think; because their minds are on another problem besides the one at hand?

Accident prevention, or "Safety First" as it is commonly termed, is a state of mind. There are two ways of accomplishing a task—a right and a wrong. Wrong methods have been used in the past and these have served to give us experience for future use, and in order that this experience will be used to its fullest advantage, rules, regulations and instructions have been issued. However this is not always the case. The same kind of accident continues to be caused. Men do not seem to profit by experience and that is why I say that prevention of accidents is a state of mind—a state which will cause men to perform a task properly.

Men must be taught that a proper tool and a proper method will accomplish any task, and it is the duty of the employer to furnish the tool and method and for the employee to use them. Accidents will continue to happen until both are sold to the idea and until such time that men will keep their minds on their jobs.

Other accidents than the one described could be cited, the responsibility of which could be charged to a state of mind caused by sickness to the man or his family, home conditions, worry over financial matters, ignorance of methods, cheerful recklessness or carelssness, thoughtlessness, hatred toward the boss, disloyalty to the company, lack of co-operation, etc.

NO "UNAVOIDABLE" ACCIDENTS

I may be criticised for the following statement but I believe it to be true—there is no such thing as an unavoidable industrial accident.

Accidents similar to those mentioned in the beginning do not have to occur. They didn't just happen—they were caused. Out of the 799 so-called lost time accidents which "happened" in the Pacific Gas and Electric Company in 1926, I doubt very much if any one of them was a real accident.

From an analysis of the accident table shown with this article it was found that practically all of the accidents could have been prevented because it was found that the biggest percentage of them fell in that class where the difficulty and the manner of correcting it lay in a man's mind—*not necessarily the injured man's mind, but some one's;* it may be the foreman's

the superintendent's, the employer's.

Progress in accident prevention cannot come until the interest and active participation of executives is secured. This means more than securing the co-operation of manager and superintendent. It involves putting executive thought and energy into safety plans and programs as well as into production, elimination of waste, cost reduction or other major activity.

When we get the sincere interest and backing of the management, our real safety movement will be born. In this form it will become a part of a thoroughgoing industrial effectiveness or efficiency, both human and mechanical. Such an efficiency will yield a high operating morale in the working force, resulting in high production and a high degree of safety.

Once the possibilities are appreciated by industrial executives, there will be aroused that interest in the safety movement which is so essential for progress, but which at the present time seems lacking.

But few records are available tending to show on the one hand that a safe plant has a high production record and on the other hand that the plant with a mediocre or poor safety record has a low production record. However, many managers and industrial leaders believe that this relationship holds and that it is only necessary to secure the production and safety records from a representative group of industrial establishments to be able to present complete proof.

None of these comments should be construed as a reflection upon the safety work already done. We have sufficient evidence that where safety work is being carried on consistently, accidents are few.

The trained leader, complete guarding and redesigning of unsafe equipment, co-operation of employees and intelligent supervision and education, all have an important part to play, but the path of future progress is to make safety an executive responsibility.

When executive responsibility is realized, the reduction of the number and severity of accidents is then a matter of organization.

A BUSINESS PROPOSITION

This reduction should be a business proposition, as is the manufacture of gas or the production of electricity. Both are produced efficiently by organization —but let each member of the organization do as he sees fit and the result will be higher costs. If employees are disinterested in lower costs due to the prevention of accidents, then they should be classed as inefficient and replaced, just as they would be if they conducted inefficiently any department of which they had control.

THREE PREVENTION METHODS

There are three methods by which accidents can be prevented: (1) Through protection or what is commonly termed guarding; (2) through education, so that the hazard may be recognized and avoided; and (3) by elimination or reduction of the hazard itself.

The first method is quick, simple and cheap, but its success rests entirely on the substructure of safety education. The purchase of 100 gas masks to be used when working with live gas means nothing until the employees have been educated to use them; and do not lose sight of the fact that education played an important part in the purchase of the masks.

The third method, the correction of the hazard at its source, sometimes termed "engineering" revision, is fundamentally sound but slow and expensive. It takes education to put this into effect: Those in positions of executive authority must be educated in the value of accident prevention to the point of authorizing the necessary expenditures, and the engineering fraternity must be educated to the point of giving more thought to safety in planning and design. The purchasing agent, too, must be educated to buy machinery which is fully guarded.

The second method, safety education, then, is not merely one of the methods by which accidents may be prevented but it is the *very basis of all accident prevention*. Without it no real progress can be expected no matter what signs, slogans, and safety devices have been erected.

Safety education, however, does not consist merely of getting out a handsomely bound rule book and handing it to the employees; it does not consist of posting a few bulletins now and then; neither does it consist of sitting around a table and talking about what is going to be done.

Safety education rests primarily upon the driving home of a new point of view about accidents and the value of human life. It seeks to teach the individual that accidents do not "happen" but are caused, and the causes are preventable. It tells him that prevention cannot be accomplished solely by executive authority, that unspoken approval of the safety movement gets no results, but that he must take an active part, individually and co-operatively. It strives to awaken his conscience to a national disgrace of an annual two and a half billion dollar loss and to the agony and suffering which never can be entered in the ledger. But to do these things, safety education must break down the old ideas, mental attitudes and habits of thought and action that are as old as the hills and persist like California's unusual weather.

MOVEMENT BASICALLY EDUCATIONAL

Accident prevention is essentially an educational movement requiring the establishment of a new point of view to be applied not only to our industrial activities but to every aspect of our lives. It is a great work, only realized by a few, and a job that taxes the

(Continued on Page 64)

A TABULATION OF PACIFIC GAS AND ELECTRIC COMPANY'S 1926 ACCIDENTS

Cause	*Percentage of Accidents*	*Percentage of Time Lost*
Falls of Persons	20.4	20.32
Falling Objects	7.8	12.70
Handling of Material	23.5	10.60
Hand Tools Used by Injured	9.4	8.25
Hand Tools Used by Fellow Worker	1.3	.17
Flying Objects	5.3	3.80
Vehicles Operated by Hand or Animal	2.5	.82
Automotive Equipment	3.7	.52
Electricity	4.5	30.70
Stepping or Kneeling on Sharp Objects	2.9	.20
Caught or Struck by Sharp Objects	6.1	.44
Hanging or Swinging Objects	1.1	.08
Defects	1.2	1.50
Machinery	1.6	8.21
Explosions	1.8	.84
Gas	1.5	.13
Poison Oak	1.6	.14
Hot Substances	1.7	.17
Animals	.5	.19
Miscellaneous	1.6	.22
	100.0%	100.00%

Comfortable
Gas Heat Next Winter
Now—while our special summer offer is effective—is the best time to arrange for the wonderful comfort and convenience of gas heating in your home next winter.
Completely automatic in operation, gas heating keeps your home at an even, healthful temperature—warm and cozy on the coldest days, but never too hot in mild weather.
This modern fuel also does away with soot, dust, furnace tending and other worries of old-style heating. Cuts house-cleaning bills. Makes your basement available as a den or play-room. Phone or write for further information.
Phone for Special Offer on Summer Installation
PUBLIC SERVICE COMPANY
OF NORTHERN ILLINOIS
(Address)
(Telephone)
*(Name of District Manager)

A specimen of the merchandising copy prepared by the Public Service Company of Northern Illinois. This was one of a series built around "human interest" illustrations. Note that the company offers special inducements to install house heating equipment in the summer months.

THERE is much sound sales philosophy in these remarks of Mr. Pershall, made before members of the commercial section of the American Gas Association, at the Chicago convention in October. The company the author represents uses a great variety of advertising designed to sell appliances, gas and electric—ranging from the newspaper to direct-by-mail, and the billboard. No season or special event is allowed to pass without being the occasion for a gas company tie-in through advertising. For instance, in preparation for Christmas, a "gift suggestions" folder was issued, with separate leaflets for a great number of appliances, and urging the giving of such practical gifts.

A few deletions are made in reproducing this paper, due to space limitations.—*Editor.*

Gas Advertising from the *Merchandising* Viewpoint

By J. R. PERSHALL
Public Service Company of Northern Illinois

MANY people have been lately reading a very brilliantly written commentary on the hokus-pocus of high-powered salesmanship and advertising, written by two gentlemen of the U. S. Bureau of Standards. Their book is called "Your Money's Worth"—an easy-to-read business treatise, not however without its vulnerable spots. The authors have considerable to say about advertising and products advertised which in no way recompense the buyer for the price paid. Let us consider for a moment the advertising story—the economic value of the advertising—behind some of our nationally known commodities. Let us compare their story from the viewpoint of advertising honesty with gas advertising in its many forms. Let us see if gas, as a public commodity, falls down on any of the scores these products do—let us see if a dollar's worth of gas is not a great deal nearer the actual value of a dollar than a dollar's worth of, for instance, a famous mouth wash, an antiseptic which has made a criminal out of a bad breath. According to the Journal of the American Medical Association, the antiseptic value of fifteen dollars worth of this solution is that of about one cent's worth of corrosive sublimate. To be sure it has a spicy smell, but dollar for dollar this spicy smell cannot be worth the difference.

Or a disinfectant spray, as famous in its own field, selling at sixty-two dollars a barrel, made of formalin, perfume and water, the price of which dropped to forty-two cents a barrel when the ingredients were made known.

Or furniture—in which industry the Bureau of Standards found 56 per cent of the wood used decidedly flimsy and non-durable for the purpose.

Or roofing materials—in which industry about 397 companies out of 400 use the simple formula of coal tar and asbestos, and sell their product at prices ranging from one to five dollars a gallon, whereas forty-five cents a gallon would bring them in a fair profit above their costs.

Or the widely advertised carbon-removers for your automobile, which, when carefully tested, show a general tendency to increase the carbon but to remove, on the other hand, the metal from your cylinder head.

GAS ADVERTISING IS ON THE LEVEL

I am not in a position to discuss the various complex merchandising factors which may or may not deserve consideration along these lines. For my purposes the bare facts are sufficient. All I propose to do is to illustrate that advertising on the subject of gas, or gas merchandise, in contrast to the other items I have named has nothing up its sleeve, is playing square with the public, describing a commodity for which a dollar brings pretty nearly a dollar's worth. And that, in these days, is something.

On the whole, the public, if it thinks of the gas industry at all, thinks of it as having gone as far as any other industry in lifting itself above the malpractices of selling second rate goods at first rate prices. The general acceptance throughout the industry of the Blue Star specifications on appliances is one of those forward steps which bring about public confidence.

In any case, and whatever the cause, the advertising appearing on gas today tells a straight story and it cannot be charged with the falseness and subtle dollar-grabbing that its critics in other fields are talking about.

This is not a general indictment of all advertising except that which promotes the sale or use of gas and gas burning appliances. Neither is it an assertion that all advertising on these subjects is above criticism. The intent behind gas advertising, however—that is, the action which it urges upon the public—is justifiable, logical, and beneficial to the human welfare. In other

(Continued on Page 48)

Thanksgiving
-304 years ago and now
GRATEFUL that their lives had been spared and an ample harvest reaped, the Pilgrims set aside the first "Day of Thanksgiving" in 1621 . . . They knew nothing of the comfort of the automobile, the pleasure of radio, the convenience of gas and electricity . . . Today, surely, we have much to be thankful for.
A Thanksgiving Dinner Suggestion
PUBLIC SERVICE COMPANY
OF NORTHERN ILLINOIS

Timeliness of advertising appeal is illustrated above. The home service tie-in deserves attention.

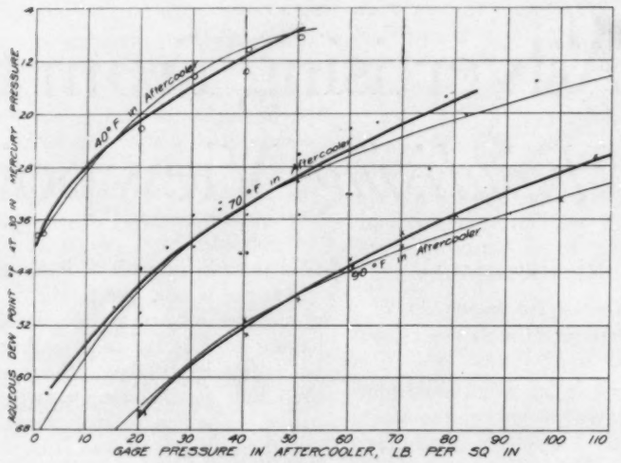

AQUEOUS DEW POINT °F AT 30 IN MERCURY PRESSURE
GAGE PRESSURE IN AFTERCOOLER, LB PER SQ IN
40°F in Aftercooler
70°F in Aftercooler
90°F in Aftercooler

Fig. 1.

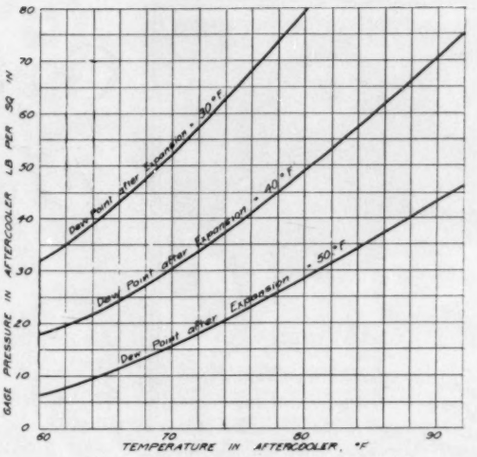

GAGE PRESSURE IN AFTERCOOLER LB PER SQ IN
TEMPERATURE IN AFTERCOOLER, °F
Dew Point after Expansion = 30°F
Dew Point after Expansion = 40°F
Dew Point after Expansion = 50°F

Fig. 3.

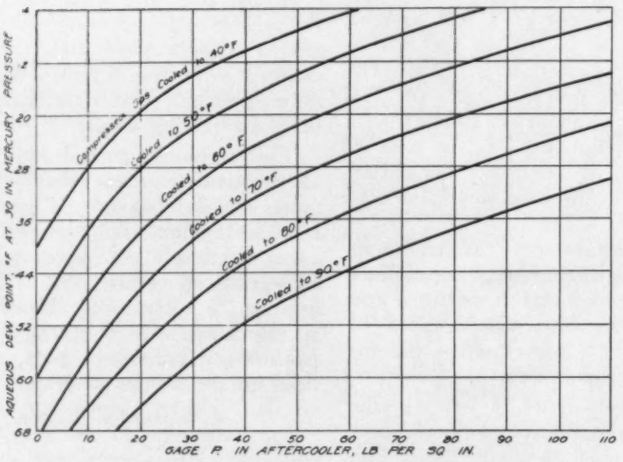

AQUEOUS DEW POINT °F AT 30 IN MERCURY PRESSURE
GAGE P. IN AFTERCOOLER, LB PER SQ IN.
Compressor Gas Cooled to 40°F
Cooled to 50°F
Cooled to 60°F
Cooled to 70°F
Cooled to 80°F
Cooled to 90°F

Fig. 2.

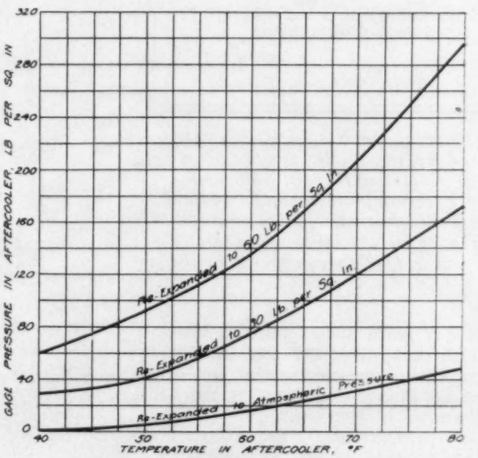

GAGE PRESSURE IN AFTERCOOLER, LB PER SQ IN
TEMPERATURE IN AFTERCOOLER, °F
Re-Expanded to 40 Lb. per Sq. In.
Re-Expanded to 30 Lb per Sq. In.
Re-Expanded to Atmospheric Pressure

Fig. 4.

Dehydration *of* Gas *by* Compression

By H. M. BARNES
*Test Engineer**
San Diego Consolidated Gas & Elec. Co.

THE importance of protecting gas mains and meters from the destructive effects of interior corrosion has resulted in a study of this problem by the San Diego Consolidated Gas & Electric Company which has extended over a number of years. The results of a portion of this investigation were described in a paper presented at the Pacific Coast Gas Association Convention in 1926,[1] and in this paper it was indicated that dehydration of the gas would be a satisfactory means for the mitigation of interior corrosion.

During the past two years various methods for dehydrating gas have been investigated, including compression,, refrigeration, and treatment with hygroscopic substances and absorbents. The principle methods available for the dehydration of gas have been described by F. W. Sperr.[2]

The San Diego County has partly high and partly low pressure distribution. On account of winter peak loads lasting only a few days, compressor equipment is available which is idle during the greater part of the year. The labor required for the operation of this equipment is the same whether part or all of it is in use. The fixed charges, which are usually a large part of the cost of compression, do not change with the load. For these reasons dehydration by compression is feasible at San Diego with only the energy cost as an added expense.

It is the purpose of this paper to present data on the dehydration of oil gas by compression and to discuss some of the fundamental principles involved. The data represent the results of laboratory tests and computation from vapor pressure tables.

EXTENT OF DEHYDRATION REQUIRED

It was found by experiment with dehydration on a semi-commercial scale, that merely lowering the aqueous dew point of the gas to a few degrees below the temperature of the soil, did not prevent corrosion in risers and meters. During the day the meter interiors ap-

*Delivered at the San Francisco regional meeting of the Pacific Coast Gas Association, November, 1927.

(1) "Oxygen and Water Vapor as Factors in the Interior Corrosion of Gas Mains": H. M. Barnes, F. M. Cota, O. Goldkamp, J. A. Harritt, D. H. Perkins, C. E. White, P.C.G.A. 1926 Proceedings.

(2) "Dehydration of Manufactured Gas," F. W. Sperr, Jr. American Gas Association 1926 Convention.

peared dry upon inspection but showed the destructive effects of water which had been present during the cooler temperatures of the night. It is apparent from the results of these and subsequent tests that in order to protect the meters, the aqueous dew point of the gas should be kept below the minimum air temperature to which the meter will be exposed.

On the basis of the minimum temperatures recorded in San Diego, it would seem that an aqueous dew point varying from 35 degrees Fahrenheit in January to as high as 50 degrees in July and August should be low enough to prevent the interior corrosion of mains and meters.

The quantity of moisture removed by compression depends upon the pressure to which the gas is raised and the temperature while compressed. The time element and the velocity of the gas in the aftercooler may also be factors due to the possibility of moisture being entrained with the gas after condensation, and carried through the expansion valve in the form of a fog. A suitable baffle or "cyclone" separator placed just ahead of the expansion valve should be effective in removing entrained liquids, so this element may be neglected in the calculations.

In order to determine the effect of compression and cooling on the properties of the oil gas distributed in San Diego, a small compression plant was set up in the laboratory. This consisted of a two cylinder air cooled electric driven compressor of the type used in automobile service stations; an aftercooler or condenser composed of a coil of copper tubing in a water bath, the latter having provision for maintaining various temperature as desired; and a suitable expansion valve to bring the gas back to low pressure conditions. At the outlet end of the copper condenser tube, but ahead of the expansion valve, an enlarged chamber was placed in the line to act as a drip and collect the condensate, and a thermometer was located in this chamber. The readings of the thermometer at this point were taken as the temperature of the gas in the aftercooler.

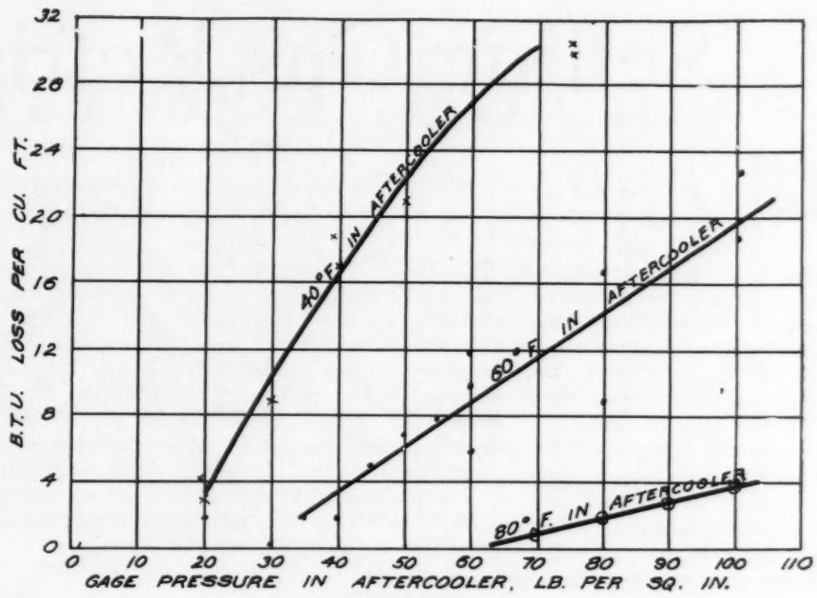


Fig. 5.

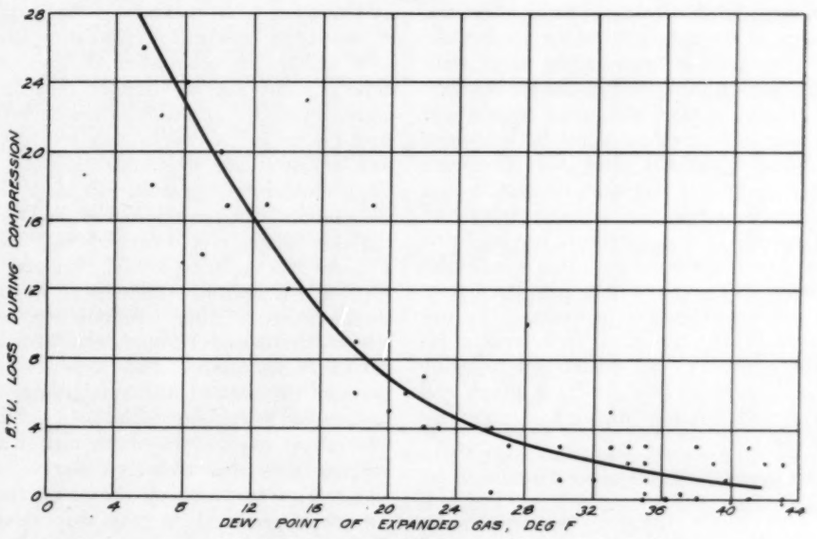


Fig. 6.

LABORATORY TESTS YIELD DATA

Manufactured oil gas contains other condensable vapors than water, the most important of which is benzol. About eighty laboratory tests were made to determine any possible effect of the combination of vapors on the quantity of water removed by compression and at the same time to check the apparatus for efficiency in removing the condensed vapors. In these tests the gas was subjected to different pressures and temperatures and the aqueous dew point determined after re-expansion. The dew points were ascertained by means of a dew-point hygrometer patterned after the instrument described in Technologic Paper No. 36 of the Bureau of Standards. Typical results of the tests are shown in Figure 1, the averages being given by the heavy lines.

Theoretical curves representing the same conditions of compression and cooling were then computed from vapor pressures as given in the steam tables. These are shown by the fine lines in Figure 1. The close agreement between the two sets of curves was considered to be evidence that the laboratory aftercooler was effective in removing condensed liquids; that the thermometer was located at the proper point to register the true temperature of the gas in the condenser, and that the theoretical results from vapor pressure calculations may be relied upon in estimating the amount of compression required by dehydration.

Dalton's Law of partial pressures was the basis for the calculation of the compression and cooling necessary to depress the aqueous dew point of the gas and vapor mixture to the various temperatures. From this law we may state: In a mixture of gases, or gases and vapors, the ratio of the partial pressures of the constituents will be proportional to the relative volumes of those constituents provided the gases are measured singly under the pressure and temperature of the mixture. This relation between the partial pressures will remain constant when the gas mixture is expanded, or when compressed to the point

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Selling Gas Refrigerators

By N. T. SELLMAN
Consolidated Gas Company of New York, N. Y.

THOSE who attended the first Southern Regional Sales Conference, sponsored by the Southern Gas Association and the American Gas Association and held at Atlanta, Georgia, November 15 and 16, considered Mr. Sellman's paper on gas refrigerator selling one of the most interesting presented in those sessions. The author may lay claim to being one of the foremost authorities on gas refrigeration in this country, haing done considerable research in that field in his connection with the Consolidated Gas Company of New York.

The importance of new findings on gas refrigeration, particularly as related to its sale, will give Mr. Sellman's remarks an added interest to WESTERN GAS *readers.*

THIS is the first opportunity I have had to discuss gas-fired refrigeration from the sales viewpoint, with sufficient experience in selling, installing and servicing, to dwell on facts rather than opinions.

In the case of the Consolidated Gas Company of New York, the sales of the Electrolux-Servel refrigerator began in a very modest way during January of this year, and the first installations were not made until March, at which time the first stock refrigerators were received. I refer to the start as being modest; this was not because we were in the least doubtful as to the merits of the refrigerator we were planning to sell—it was simply to provide time for training the required number of people for sales and installation work. Classes were conducted for both groups, so that when the first advertisements were to appear the organization would be ready to function without delay and mistakes. It was not until late in April that conditions were such that a full sales release was given, which permitted public announcements to be made. The initial publicity consisted of a weekly ⅛-page newspaper ad, posters on company trucks, exhibits at three trade shows and floor and window displays in company offices.

ENCOURAGE SALE TO EMPLOYEE

Due to the newness of gas-fired refrigeration, it was felt that much would be gained by having as many employees as possible use the refrigerator in their homes, and consequently a special price was arranged for employees so that they could purchase refrigerators at practically cost and on small monthly installments.

Considering the sales period from April 1st to November 1st, the sales have been approximately as follows:
Standard 7 cu. ft. box to customers—300
Standard 7 cu. ft. box to employees— 75

Of the 300 sold to customers, all except 95 were individual sales. The 95 were divided between two large building projects—one a large apartment house in lower New York City, the other a group of private houses in Westchester county. In addition to this, 16 refrigerators of the new low type 5 cu. ft. box have been sold. Two other orders for large apartments account for 200 units placed in special boxes, making a total of all types of Electrolux-Servel units slightly over 600.

The gauge for measuring the degree of success in selling a refrigerating unit, such as the Electrolux-Servel, does not depend solely on the number that have been installed. It must be remembered that up to a few weeks ago we had a box of only one size and quality. A single model only permits you to be "on the market" not "in the market." When the one model is too large and expensive for the volume trade, it is to be expected that most sales will be for single units. This situation is now slightly improved through the addition of the low cabinet base type, which permits the top of the refrigerator to be used as a working table, or a cabinet gas range may be placed on top of the refrigerator—thus making the stove and the refrigerator occupy the same space otherwise required for the stove alone. From now on we should be able to expect, at reasonable intervals, further models of both smaller and larger capacity; consequently, we may expect to become a growing factor in refrigerator sales.

IDEAL SALES LINE

The ideal merchandising arrangement for the successful selling of refrigeration requires a complete assortment of box sizes with varying height, width and depth; furthermore, it decidedly improves the situation if boxes of varying quality are available. For advertising purposes it is always well to have a unit of such size and quality that a price can be set which sounds reasonable as compared to similar articles sold by competitors. Today we are often compelled to compare a 7 cu. ft. gas-fired refrigerator of high quality with an electric refrigerator of 4 cu. ft. capacity, which is lighter in construction and of cheaper material. The prices are of such variance that it is difficult to convince a person wherein the big advantage in values lies. When we are equipped with a similar 4 cu. ft. box, and can show the varying quality and size of our product, it becomes a much simpler problem to convince a person that possibly the larger and better built box is after all the safer purchase.

Most of the modern kitchens and pantries are small and require that consideration be given to the dimensions of each piece of equipment that is to be used. Kitchen plans frequently call for a refrigerator of non-standard dimensions, and this necessitates the building of special refrigerator boxes. As previously mentioned we have already sold refrigerating units for adaption to special boxes. In one instance, 147 Electrolux-Servel units of 50 lbs. capacity were installed in special low type boxes for use in the serving pantries of a large apartment hotel; in another case 53 units of the 50 lb. size were placed in a narrow upright box having approximately 4 cu. ft. capacity.

In order to be able to sell gas-fired refrigeration to people who already own large and well built ice-boxes, we have given consideration to several refrigerating units that are suitable for installation separate from the box, and have in the interest of this development made a few installations of Ico-O-Lator units. As time goes on and we find a good commercial refrigerating unit for use in stores, we will undoubtedly enter this field as well. I mention this because I believe it is important to bring out at this time that gas-fired refrigeration presents a very wide field, which can only be completely provided for with a wide variety of refrigerating units, and now is the time to study and plan for the best methods to secure and keep the refrigerating business.

WHAT COMPLETE LINE WILL BE

A few years from now the selling organization of a gas company merchandising refrigerators will, in all probability, have the following equipment to sell:

Refrigerator and unit complete in 6 sizes.

Domestic units for installation separate from the box in 4 sizes.

(Continued on Page 52)

The *Venting* Problem

Walter M. Berry

By WALTER M. BERRY
Consulting Gas Engineer

SATISFACTORY and safe operation of many types of gas appliances is largely dependent upon adequate provision for carrying away the products of combustion. Climatic conditions and general construction of buildings in a city largely determine whether a flue connection is necessary or desirable for the smaller gas appliances.

The high humidity of winter climate in the Pacific Northwest makes venting of practically all gas appliances necessary. In Southern California, space heaters, if inherently safe, can be used safely without venting if the users are sufficiently intelligent to realize that it is impossible to eliminate both venting and ventilation.

VENTING CONDITIONS DIFFER

In many of our eastern cities the venting of the ordinary domestic appliances such as gas ranges and small water heaters is not generally favored because of the frequent down-drafts resulting from wind pressures. With greater congestion and irregularity in the height of buildings there is greater likelihood of down-drafts in flues and chimneys.

In view of the above mentioned conditions, it is very difficult to get any unanimous opinion on whether we should or should not have universal venting of gas appliances. There is rather general agreement, however, that if appliances are flue connected, the flue or chimney should be adequate in size and properly constructed so as not to give the occupant of the home a false feeling of security in the efficacy of the flue.

Notwithstanding all that can possibly be done to provide adequate venting, there are times when the flue will become inoperative. The requirements of the American Gas Association that appliances should give good combustion with only such a vent as can be incorporated into the appliance itself is therefore a reasonable one, nothwithstanding the fact that it may in some cases result in a reduced rating for water heaters and other heating appliances, and ultimate greater initial cost to the user.

A discussion of the venting problem is particularly timely in view of the fact that the American Gas Association has recently distributed for criticism its proposed Requirements for House Piping and Appliance Installation. These requirements establish among other things the minimum allowable sizes for flues. If there are any changes or additions desired in these specifications the suggestions should be made now before the specifications are adopted as final standards and copied into municipal ordinances.

MORE FLUE DATA NEEDED

We are still greatly in need of more complete and accurate information on flues and chimneys. What information we have is in many respects inaccurate and apt to lead to wrong conclusions. A table of chimney sizes given in a very valuable and frequently used handbook on gas boilers shows that if the height of a chimney is increased four times, the cross sectional area can be reduced to one-half. This leads to some absurdities; for example, we find that a chimney fifty feet high and with an area less than that of a 2¼-inch pipe will take care of the products from 35 thousand B.t.u., which of course it will not do. On the other hand, the table indicates much too low a capacity for the larger sizes.

Perhaps the very best appliance installation manual now in existence is the Gas Appliance Installation and Service Manual published by the Pacific Coast Gas Association. The original data in this manual, with the data published in the American Gas Association Monthly of June, 1926, form the basis for the requirements now proposed by the American Gas Association. A review of the original data seems to show that additional factors should be taken into consideration in order to make the data generally applicable.

CORRECTION OFFERED

Before going into the discussion of the various factors that should be considered in determining the correct size of flue, it may be desirable to correct one statement that appears in the Gas Appliance Manual. On page 36 it states—"If we were for a moment to close the inlet to a chimney, and were able to change its height, we would find that the suction of our U gauge would increase as the square root of the height; that is, quadruple the height of the chimney and we would get double the suction."

The maximum intensity of the draft, or what is often called the "stack effect," is that resulting from the difference in weight of the column of hot gases within the flue and an equivalent column of air at the outside temperature. The maximum theoretical intensity of the draft as shown in the following table is the draft that would be shown on a gauge at the base of the flue with no flow through the flue and if the gases were at the temperature shown.

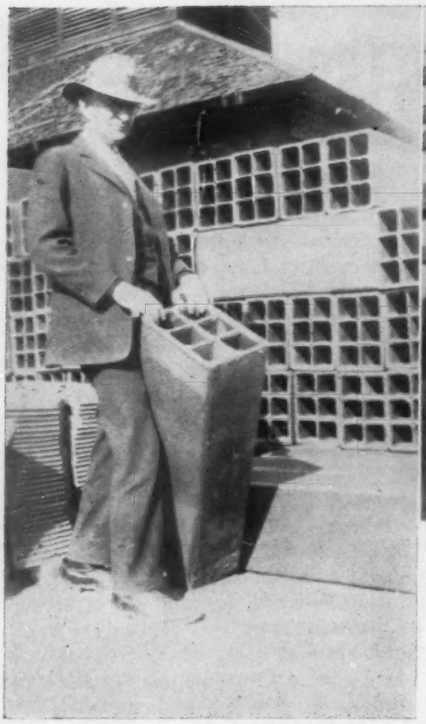
THE FORCE OR INTENSITY OF DRAFT, IN INCHES OF WATER PRESSURE

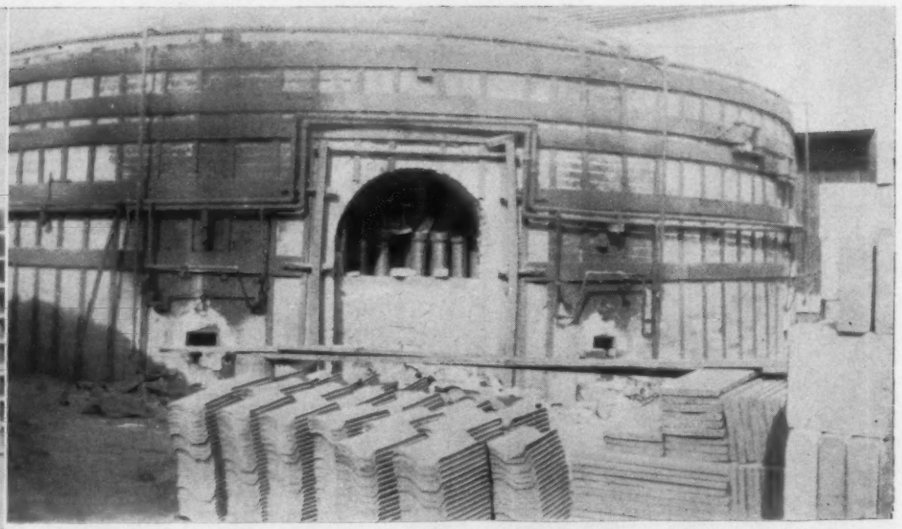
(Not allowing for difference in density of air and flue gases)
Temperature of air, 60 Deg. F.

Average Temperature of Flue Gases	Height of Flue in Feet 10	20	30	40
150	.0219	.0439	.0658	.0877
200	.0313	.0625	.0939	.1253
250	.0395	.0790	.1185	.1580
300	.0467	.0935	.1402	.1870
350	.0529	.1057	.1586	.2115
400	.0584	.1168	.1752	.2336

From the above table we see that the "stack effect" increases directly with the height of stack, assuming that the temperature remains constant, and not as the square root of the height as stated in the manual. This theoretical draft, although never secured in practice, is of very great value for calculating flue capacities, for the effective draft in a flue is this theoretical draft less the pressure

(Continued on Page 56)





Above: Telephone conduit, fired in gas-burning kilns. Right: Kiln full of sewer pipe, being cooled prior to unloading

Firing Sewer Pipe, Telephone Conduits *and* Fire-Proofing Materials, Using Gas *as* Fuel

By LEE HOLTZ
Southern California Gas Company

HAVING in the preceding articles touched briefly on the manufacture of the principal exterior heavy clay wares, and, before going into the production of sewer pipe, telephone conduits, clay fire-proofing materials, etc., or in other words, the class of ware which is seldom seen except by those associated with construction work, it will perhaps be of interest to say something regarding clay materials.

To carry out the burning process intelligently, one should have some understanding of the minerals being dealt with and their behavior under fire. It is the writer's contention that the more knowledge the gas sales engineer has on the clay burning subject, the more satisfactory will be his dealings with the ceramic customers, not only in selecting the proper burners and the number to be used but in obtaining the best results after the installation is made. This is particularly true in cases where some fuel other than gas has always been used and the kiln operators have not had experience with the new fuel.

The firing of clay wares, while most interesting, has always been and perhaps will continue to be a more or less complicated problem by reason of the fact that the action of the clays and their mineral content changes so materially through the different heat periods.

The complete story of clay is quite long and no attempt will be made here in the brief space allotted to give other than a general conception of its composition. Later, however, more will be said on this subject, regarding the behavior of clay under fire.

The mineral mass known as clay is a hydrous aluminum silicate generally mixed with powdered felspar, quartz, sand, iron oxides and various other minerals and is formed from the disintegration of aluminous rocks, chiefly from felspar in granite.

The clay beds which are today furnishing materials for the clay industry were for countless ages in the process of development. Deposits were gradually built up, the surface of which became covered with vegetable growth. As time elapsed erosions and deluges took place, removing the earth's crust from one location to another, in some cases only again to be buried to great depths and hardened by heat and pressure. Vegetable matter was converted into lignite, coal, graphite and the pores of the clay mass filled with the distillates of animal and vegetable remains.

In the meantime, surface waters were circulating through the clay beds purifying in some cases and defiling in others. Iron minerals were being disintegrated and the iron was converted into oxides, sulphites, sulphates and carbonates. Lime, magnesia and alkalies were also changed into sulphates and carbonates.

Each clay is a separate problem of complex mineral mixtures of which the constituents vary extremely and are to be reckoned with in the kiln problems.

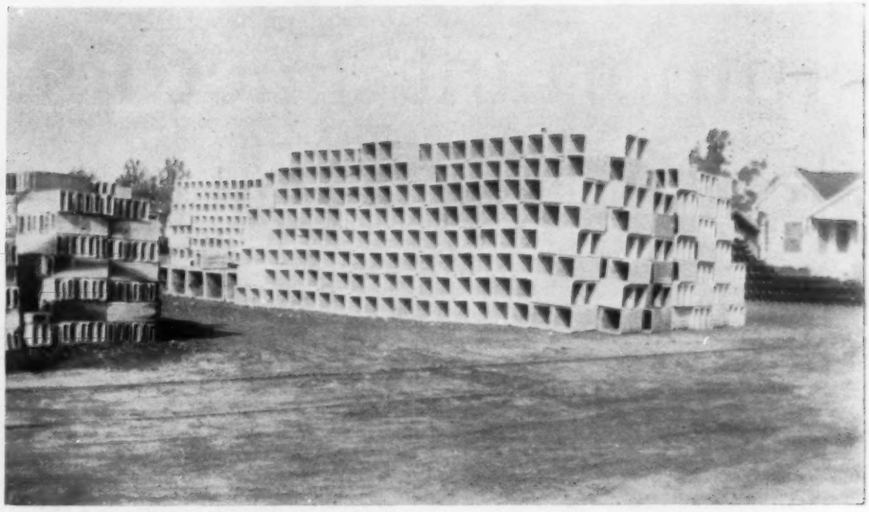
The clay worker's problem is to take clays unlimited in their variations and burn them into a limited number of wares. He is dealing with materials, the fusion temperature of which varies from cone .022 (1,094° F.) to cone 39 (3,470° F.) and perhaps in some cases to even a greater temperature.

Clays which are used for common wares, such as common brick, roof tile, etc., are often impractical for face brick products or vitrified wares, but on the other hand, clays which are suitable for the latter products are easily burned when made into the former products.

Clay wares, particularly the common kind, such as have been mentioned in previous articles, are not burned to complete fusion. Complete vitrification, under any definition applicable to clay wares, is simply filling the pores of the clay mass with fused material. Many vitrified wares run five to six per cent absorption and some as high as ten per cent and find acceptance in the markets.

Most sewer pipe and telephone conduits are made from shale, which after crushing is mixed with the necessary amount of plastic materials. When the proper consistency is attained at the pug

PART V *in a Series of Articles on Gas Use in the Ceramic Industry*



Square tile shown above are for flue lining

mill or mixing machine, a belt conveyor carries the material to the cylinders of a massive press. Through these, under a pressure of 25 tons, the clay is formed into the desired shapes. So powerful and yet so sensitive and adaptable are these presses that by use of the proper dies, all sizes and shapes can be made by one machine.

The usual capacity of one machine for a day's output will run from 16,000 feet of 4 inch pipe to 750 feet of 30 inch pipe.

From the presses, the pipe goes to the drying floor where it remains until sufficiently dry and hard enough to burn. Great care must be exercised during the drying period to maintain even and suitable temperatures. Failure to do this might easily result in warping or cracking of the ware.

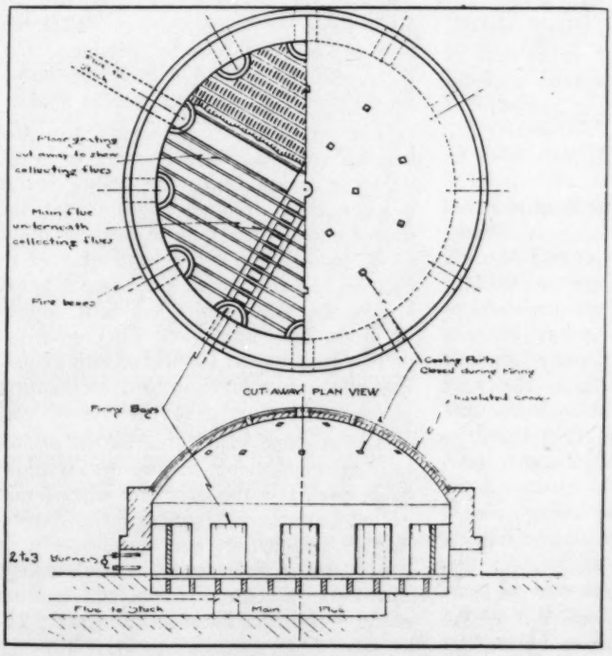
The dry pipe or conduit is set usually in the round down draft kilns from 30 to 40 feet in diameter in which from 50 to 55 tons of material can be placed. Various sizes are usually combined to afford maximum loading and yet allow free circulation of heat around and through the ware during burning. When the loading is completed, the doors and other openings are tightly sealed and a slow fire is started for the purpose of driving off the moisture and chemically combined water.

The burning of sewer pipe and telephone conduit usually requires about five days time. Approximately 6,000 cu. ft. of 1100 B.t.u. natural gas is needed for 55 tons of ware and the maximum temperature attained is 2,200° F.

Salt glazing is a most interesting feature in the manufacture of this particular ware and is done at the end of the burn. Glazing is done for the purpose of fortifying the ware against corroding soils and sewer gases.

The most common practice in salt glazing is to shovel ordinary rock salt into the fire boxes after a temperature of about 2,000° F. is reached. This is done in 10 to 15 minute periods for about eight hours, requiring about one ton of salt for 50 tons of ware. The salt before using is screened through a No. 5 mesh screen.

Under the intense heat of 2,000° F. the salt vaporizes, its fumes fill the kiln and in contact with the material decompose, unite with the free silica and other substances, such as iron or iron oxide in the clay to form a glaze over the entire surface of the ware. A salt glaze is merely a soda-silica-alumina glass coating.



Cross section of typical 30-foot down draft kiln, 12 firebox. Usually four kilns are connected to the same stack

Salt is used because it is cheap, fuses and volatilizes in as low a kiln temperature as 1400° F. and does not change chemically in fusion or volatilization.

It is essential that some degree of vitrification be obtained before salting begins; otherwise, the glaze would be absorbed into the body of the ware and a satisfactory surface would not be obtained until the pores of the ware had been filled, which would take considerable or an excessive amount of salt.

ADVANTAGE OF GLAZED PIPE

Owing to the fact that vaporizing salt absorbs heat just as vaporized water, and that this heat is taken from the fire, it becomes necessary to conduct the interval salting periods in order to maintain the correct firing temperature. During the salting process, the kiln dampers are closed, maintaining a balanced draft to let the fumes penetrate.

The color of a salt glaze is affected by the character of the kiln atmosphere as well as by the composition of the body. The natural color of a salt glaze is a golden yellow but under reducing conditions it absorbs carbon and the color darkens to a brown or a dull black. If the body is dark as in shale pipe, the color of the pipe surface is correspondingly dark due to the dark background.

The vitrified body and glazed surface give to this product a combination of strength, impermeability, resistance to chemical attack and maximum flow capacity unequalled perhaps by any other material.

After glazing is completed, the cooling is regulated so as to anneal the ware properly for market.

To the writer's knowledge, direct fire car tunnel kilns have not been used with any degree of success because of certain difficulties encountered in the

(Continued on Page 64)

Important Factors *in* House Heating With Gas

Gas Fired Equipment vs. Converted Coal Equipment

By J. W. DUVALL

*Oklahoma Gas & Electric Company, Oklahoma City, Okla.**

UPON entering the house heating field it becomes necessary for the utility to adopt more or less definite policies upon which to base its house heating program. Existing conditions influence these policies materially, but in general it may be stated that where the highest efficiency of utilization of the gas is desired, and therefore the lowest heating cost, and a satisfied customer for the life time of natural gas, and a customer educated on house heating with gas and prepared to burn manufactured gas, the answer is the sale and installation of equipment designed for gas. However, if the house heating program calls for increased revenue in a relatively short period of time and therefore without due consideration of the above mentioned points, the answer is the conversion of equipment designed for coal. Experience has proven that it becomes necessary to adopt a more or less fixed policy; otherwise nine conversion jobs will be sold to one gas-fired job, due, of course, to the difference in the cost of installation.

A policy favoring gas-fired equipment does not necessarily mean that no conversion work will be done. It should mean that gas fired equipment will be advocated. Conditions arise sometimes where gas-fired equipment cannot be sold and in order not to lose the load to some other fuel it becomes necessary to talk conversion with gas.

Converted Coal Equipment Inefficient, But Gas Can Compete if Necessary

A great deal of the converted coal equipment in use today is very inefficient, due to the faulty installation of gas burners which are not particularly adapted for the job. Never-the-less, this much can be said in favor of conversion jobs, that equipment designed for coal, when converted to gas with the proper type of burner, correctly installed, can be made as efficient with gas as any other kind of fuel. It is the general opinion that coal equipment converted to oil can be made far more efficient than coal equipment converted to gas. This erroneous opinion is no doubt due to the fact that the oil burner industry has done a much better job of converting coal equipment than the gas industry.

There are today on the market many types of gas burners for converting coal equipment. If properly selected and correctly installed, the results will be quite satisfactory. In selecting this burner equipment, keep in mind that coal equipment is properly designed for coal and to convert it to gas with the highest possible efficiency, we must quite closely duplicate coal fire conditions. We all know that most of the heat from coal is transmitted by radiant energy to the heating surface and very little heat is obtained from the products of combustion. Therefore, in selecting gas burners choose the radiant type of burner or the luminous flame burner, if you wish to get results.

In conversion work it hardly seems advisable to make any major changes in the heating system, for the cost of such changes, plus the cost of the conversion, approximates the cost of gas-fired equipment and in the end you have only a converted coal job. Neither does it seem advisable to determine the heat losses of the house and estimate the heating bill, due to the fact that the efficiencies of conversion jobs vary considerably.

In conversion work every means should be utilized to obtain the highest overall efficiency. To accomplish this end, no conversion job should be sold without a gas pressure regulator and a high class heat regulator. These two last pieces of equipment have a great deal to do with the satisfactory operation of the job. It is my opinion that a conversion job without a pressure regulator and a heat regulator is better left unsold.

Most of the conversion work in the past has been handled through the plumbing trade. The trade's idea of a conversion job was the placing of a cheap gas burner in the fire door of the coal equipment in such a manner that it could be readily removed for the burning of coal. There is no reason why this phase of the house heating program should not be handled in its entirety by the utility, for certainly the utility understands the application of gas to coal equipment to a far greater extent than the heating trade.

The Utilities' Position in the Heating Industry

The gas utilities' entrance into the house heating field has been accompanied by many trials and tribulations. It was realized from the start that the good will and cooperation of the architects, contractors and the heating trade were necessary in order to accomplish the most in this new line of endeavor. In order to gain this good will and cooperation, it becomes necessary to sell them on the advantages of gas over all other fuels for house heating. This can best be accomplished by personal contact, telling them the story of house heating with gas, over and over again.

The architects, contractors and the heating trade are in a position to be of valuable assistance to the utility for it is upon their recommendation that the owner chooses the type of heating plant to be installed and the kind of fuel to be used. Then again, the heating trade knows the heating business as it applies to other fuels and with the knowledge of the utility as to the utilization of gas, the two can solve any and all heating problems pertaining to the use of gas.

The sale and installation of the proper heating equipment for homes without basements and the sale and installation of the proper equipment for the conversion of coal boilers and furnaces can be very nicely handled by the utility. However, the gas fired central heating plant presents a far more difficult prob-

*Excerpts from a paper delivered before the South west Division, Natural Gas Department of American Gas Association, at Houston, Texas, November 1.

lem in that the gas company is not in a position to handle the greater part of the necessary equipment, and therefore the extent of this work is a matter of company policy. The policy best adapted for carrying out the house heating program depends somewhat upon local conditions. Many utilities find it advisable to handle this work entirely through the heating trade, the utility acting in an advisory capacity only. Other utilities find it necessary to organize a house heating department and handle a portion of the business direct with the customer. Many utilities have found this latter policy produced very satisfactory results during the early stages of house heating.

House heating data on these gas-heated homes in Oklahoma City, Okla., will be found in the table appearing on a continue page.

Above: See house heating table, Job No. 24

No particular complications arise when gas equipment is sold for new heating installations, for it is realized that if the architect specifies gas-fired equipment and the owner approves of it, the specifications will call for it and the heating trade will bid on it. Under these conditions, the utility merely specifies the type and size of gas equipment and quotes the heating trade a price on this equipment and accessories, including the heat regulator.

Many times complications do arise in selling gas equipment through the trade for existing heating plants. These complications are due to the fact that it requires considerable sales ability on the part of the utility to sell this equipment, which is priced out by the trade. Therefore, there are two organizations entering into the transaction, neither one of which can talk intelligently on the other one's part of the transaction. Also another complication which enters into the transaction is the customer's desire for the payment plan, which the heating trade in general will not honor. Therefore, in many instances the only way that gas equipment can be sold for existing heating plants is to handle the transaction direct with the owner and allow him the privilege of the utility's payment plan.

Below: See house heating table, Job No. 8

Natural Gas Is Pioneering the Way For Artificial As Supplies Dwindle

Always uppermost in the public mind, relative to the use of gas designed equipment for house heating, is the question of gas supply. It seems to be the general opinion that when natural gas is gone, gas designed heating plants will be no longer useful. Of course, such would be the case if the natural gas industry were not looking farther into the future than the life of natural gas. It is reasonable to expect that no community of ten thousand or more inhabitants will be without manufactured gas when natural gas passes. Many smaller towns today have manufactured gas in which some progress in house heating with gas has been made.

In this section of the country, where millions of dollars have been invested in gas transmission lines, it is reasonable to expect that these lines will be used for the transmission of manufactured gas, when the proper time arrives. The gas will be manufactured at points along these transmission lines where economic conditions warrant. The gas industry has already devoted considerable study to this subject of high pressure transmission of manufactured gas and in some localities manufactured gas is being piped a considerable distance under high pressure conditions. The utilization of existing pipe lines for the transmission of manufactured gas means that many of the smaller towns which could not support isolated plants will continue to have gas service. When such a time

Above: See house heating table, Job. No. 6

arrives, the great demand built up by natural gas and passed on to manufactured gas, together with the improved methods of manufacture, will mean a rate that will permit its use in efficient gas equipment.

Another disturbing matter brought up for discussion almost every time that house heating with gas is mentioned has to do with periodic interruptions of service, due to things beyond the control of the utility, such as pipe line breaks and compression station shutdowns. While these interruptions of service are annoying, both to the public and to the utility, they seldom exist for more than a few hours and the inconveniences resulting therefrom and the harm done are more imaginery than real. Of course, these remarks have to do with those utilities receiving gas from long pipe lines which tap many fields, for those utilities not so fortunately situated with reference to gas supply are seriously handicapped in house heating with gas.

Annual Load Factor; Its Relation To Design Temperature

The poor load factor of the house heating load has been responsible to a greater degree than any one other thing for the utilities' attitude toward this class of business. The heating industry knows little and cares less about this subject of load factor, and therefore it behooves the gas industry to give due consideration to ways and means of obtaining the highest possible load factor for this new class of business.

It is common practice with the heating trade to use the same design temperature in widely varying sections of the country. This erroneous practice is due undoubtedly to the fact that most of the data used by the trade are computed on zero design temperature and are the most convenient to use as published.

In order to obtain the best possible load factor, in the house heating load, it

(Continued on Page 55)

PACIFIC COAST GAS ASSOCIATION

447 Sutter Street, San Francisco, California

A Department Conducted by Clifford Johnstone, Executive Secretary

150 Association Men at Regional Meeting

HE Central Regional Conference at San Francisco on November 17 and 18 was attended by about 150 members. Four notable papers were read at the general meeting on the first day, and of these that by T. J. Ryan, on "The Present Status of Valuation for Rate Fixing," and that by H. M. Barnes, on "Dehydration of Gas by Compression," appearing on other pages of this issue of *Western Gas*.

While not as well attended as had been expected, the simultaneous meetings of the sections on the second day afforded an opportunity for a thorough discussion of the section work and aided materially in defining the scope of the year's programs.

Directors Meeting

At the meeting of the Board of Directors, held in connection with the San Francisco conference, a decision was reached to hold the Southern Regional Conference in Los Angeles on February 23 and 24.

Other action by the Board included the election of C. B. Babcock to fill out the unexpired term of Wynant Van Zandt, who recently resigned. Mr. Babcock is very well known to all association members, having been active in the association for many years, serving as President in 1917.

HOME SERVICE DIRECTOR

The Board thoroughly discussed the recommendation of the 1927 Commercial Section as voted at the Santa Cruz Convention, that the Association employ a Home Service Director to aid member companies in conducting cooking schools and publicity directed toward securing the confidence and good will of women customers. While the project is entirely feasible, it was decided to hold the matter in abeyance until there is more evidence of interest on the part of member companies.

GOLD MEDAL AWARD RULES CHANGED

Upon the recommendation of the 1927 Awards Committee, the Board approved a change in the basis of awarding the Association's Gold Medal for papers and reports presented to the Association. The task of examining and judging the work of individuals and committees is tremendous and for the last two years has engaged the entire convention time of all of the eight committee members. The changes approved involve the setting up of a separate award for committee reports so that all members of a committee can receive some token of the Association's approval of their effort. The Gold Medal will be awarded only to papers written by individuals.

The judging for the Gold Medal and the Committee Award are similar and require a mark of 90 per cent for the award and 80 per cent for honorable mention.

Review of Commercial Section Proceedings

THE Commercial Section was called to order at 9:30 a.m., with a very gratifying attendance. Introductory remarks by the Chairman were to the effect that the meeting was called for the purpose of discussing the proposed Commercial Section program for the fiscal year, in order that the committee chairmen might have the benefit and advice of those present in laying out their respective studies.

An animated discussion on committee subjects consumed the entire morning and the meeting was finally adjourned after a twenty minute over time session, to permit those present to attend the noon luncheon. The scheduled speakers were crowded out. Three papers had been prepared on special industrial appliances; one by Fred Deitrick on "Soft Metal Melting"; one by I. L. Heckinger on "Hotel and Restaurant Appliances"; and one by James Geddes on "Heat Treating", but none of these gentlemen had an opportunity to display his wares. There seemed to be no lull in the meeting that would warrant interruption by the Chairman and a postponed meeting for the afternoon was thought inadvisable on account of conflicting with the Board of Directors' meeting which was scheduled for 2:30.

Clyde H. Potter, Vice Chairman of the Commercial Section, will be in charge of the Commercial Section meeting to be held in Los Angeles in February. All committee chairmen were given notice that a written progress report would be expected of them on the occasion of the second annual meeting.

There is every evidence that the Commercial Section has gotten away this year to a flying start. If the enthusiasm continues, an interesting and constructive program is assured on the occasion of our annual convention.

C. R. Miller,
Chairman, Commercial Section.

Public Relations Group's Meeting Summarized

THE Public Relations Section met in the Empire Room of the Fairmont Hotel, Friday morning, November 18. The attendance was twenty-nine.

The regularly published program materialized, to the satisfaction of all present. Incidentally, the meeting was a demonstration of the soundness of the plan by which the Public Relations Section this year is securing its papers for Conference and Convention programs.

Frank Wills, Engineer of Production, Pacific Gas and Electric Company, presented a paper on "Public Relations Through Service." Mr. Wills demonstrated that a technical man is an element of strength in the Public Relations lineup. The speaker dwelt on both the physical and the human side of service, and suggested that it would be valuable if a committee of both Public Relations and Technical men should prepare a manual of standards for handling work on the consumers' premises.

The paper was discussed by H. C. Ross and Walter H. Cohick.

A paper on "Public Relations Through Employee Contacts" was read by H. W. Beekman, Supervisor Service Bureau, Pacific Gas and Electric Company, Oakland. Mr. Beekman drew upon his experience for the data which he presented, and which brought forth a gratifying amount of discussion. Mrs. Withers and Miss Lehr, representing the Home Service activities of the P. G. and E., joined with others in the discussion of this paper, to the pleasure and edification of the mere men present, who, some think, pay too little attention to the whims and opinions of the kitchen mechanics and household engineers who

"turn the valve" that makes the meter's hands go 'round.

Added to the paper on "The Body Is Not One Member But Many," which J. F. Pollard presented at the General Session, Thursday afternoon, for the Public Relations Section, this forenoon meeting finished up a very successful first chapter in the year's activities of the Section.

D. L. Scott,
Chairman, Public Relations Section.

Resume of Technical Section Session

AN interesting talk was given by V. R. Hughes, Mechanical Engineer, Pacific Gas and Electric Company, demonstrating various methods of hooking up indicators to various types of engines. Attention was directed to precautions necessary to obtain accuracy of cards. Demonstration was made of various types of hook-up mechanism, particularly the use of separate outside light weight wheel for reduction on high speed engines.

L. A. Fulton, of the Pacific Gas and Electric Company, Oakland, discussed operation of their compressor plant. L. B. Jones discussed comparative costs of electric drive and Diesel engine drive for compressors. Mr. Smith of Fresno commented on the high investment costs of Diesel engines as compared with other prime movers. Mr. Hughes directed attention to the desirability of the use of synchronous motors, due to the fact that they tend to improve the power factor on electric lines.

DISCUSSION ON DIESEL OIL

A discussion was then had relative to the use of light gravity or Diesel engine oil for use in generators, for gas making. Mr. Hargreaves of San Jose reported that in tests made by him, but little increased capacity of the machine was noted. The runs were started with the ordinary type fuel oil, and then finished with the light oil. After about one hour's operation, the generator was found to be too cold for satisfactory gas making when using cold Diesel oil. Further tests were then made with the oil heated to 220°, but again with discouraging results, the generator becoming cold after six hours' operation. The gas production of this Jones type machine fell off decidedly, although 11 gallons of oil were introduced per M.c.f. made. The wash box was quickly filled with tar, although little lampblack was formed. The maximum temperature in the generators was about 2,200°, while the temperature in the secondary shell was 1,100°. Fred Jones of San Francisco stated he believed the generators were subjecting the oil to too high a temperature. L. B. Jones reported tests which he had made, stating that he did not accomplish satisfactory results with light oil when tested over a very wide range of temperatures, and believed that any increased capacity of the generator would be but temporary, but that the use of light oil might be desirable for a short time on a badly carboned machine. Mr. Sauer of Marysville reported that on tests with light oil made on a single shell machine, after changing sprays and burners, the capacity was increased from 27,000 to 30,000 cubic feet per hour. L. B. Jones reported tests made a number of years ago at the Metropolitan plant in San Francisco, using an oil much resembling kerosene, which required 11½ to 12 gallons per M.c.f. made. Prof. Graf of Corvallis reported tests made by the Portland Company using Diesel oil, and stated that the lampblack produced was of a poor grade, and more tar was formed.

J. M. Dickey, San Francisco, discussed gas scrubbing and recirculating of water, showing an increased economy in the use of water by about 30 per cent for the total plant. L. B. Jones discussed the matter of gas velocities, stating he believed that the higher velocities resulting from reduced cross-sectional area of scrubbers produced higher efficiencies, as has been demonstrated by the Steere scrubbers.

Mr. Bahr of San Rafael discussed purifier box connections, showing the desirability of large revivification pipe connections, in order that the work could be completed quickly. Mr. McCarthy of San Francisco stated that at the Potrero plant, 50 to 60 times excess air is used, and the maximum temperature is reached in the boxes within one-half hour. This is accompanied with the lowest oxygen content of the outgoing air.

Discussion was then had in regard to the quality of oil now available for gas manufacturing purposes. L. B. Jones pointed out that the quality of gas oil now being delivered to the various gas manufacturing utilities in this state is not of any standard or definite quality, but varies from time to time, and is in fact merely a measure of refuse oil from various distillation and cracking processes, and because of this situation it is now impossible for the large gas plants to operate with reasonable manufacturing efficiency. Further, Mr. Jones pointed out that at the present time none of the gas companies is able to state specifically its actual requirements for gas oil in such terms as will assure delivery by oil companies of oil of the proper characteristics. In view of this situation, Mr. Jones urged that a committee of the Technical Section be organized to prepare adequate specifications for gas oil.

The Chairman of the Technical Section advised that a committee would thereupon be appointed to investigate oil specifications, and to prepare such specifications, if possible.

H. L. Masser,
Chairman, Technical Section.

Accountng Section Plans Work for Year

THE attendance in the Accounting Section was very disappointing numerically, but what was lacking in numbers was more than made up for in the discussion of the various subjects considered.

For the present year the work of the Accounting Section has been divided up into seven committee classifications, as follows: Undistributed Costs and Fixed Capital Ledgers, Accounts Payable, Financial and Operating Reports, Ratios and Graphs, Depreciation, Statistics, and Bi-Monthly Billing. At the San Francisco meeting discussion was had on the scope of these committee activities. Following the outline of committee work there was informal discussion on a number of subjects, among them that of fixed capital accounting.

T. J. Ryan of the Pacific Gas and Electric Company was the Accounting Section's representative before the general session of the conference, and his highly interesting paper on "The Present Status of Valuation for Rate Fixing" appears in this issue of *Western Gas.*

W. E. Robbins,
Chairman, Accounting Section.

Gas Engineers' Handbook

The San Francisco Conference afforded an opportunity for several meetings of the editorial committee of the Gas Engineers' Handbook. This is one of the most important projects now before the Association and it is hoped that it may be completed during this Association year. A very large amount of material has already been collected and the efforts of the Committee during the San Francisco meeting were directed toward studying this with a view to including only the latest and most authoritative data. R. M. McCalley, of Portland, is Chairman of the Committee and he is being aided by Frank Wills, San Francisco; H. L. Masser, Los Angeles, Chairman of the Technical Section; President L. M. Klauber, and the Secretary.

EDITORIAL

New Light On An Old Problem

NO modern Daniel has yet come to judgment to say the final word on the gas company-dealer situation. There are still those who frankly favor the gas company establishing a merchandising policy without regard to any possible effect upon dealers. Others would keep the company's hand strictly out of the appliance business; and some choose the middle ground of dealer co-operation.

But the governing fact is that appliance sales, by whomsoever made, are the only guarantee of future prosperity for the utility. When other agencies fail the gas company's only resort is to do the selling.

The Pacific Gas and Electric Company, which for several years past has pursued a policy of assisting dealers in its territory to do the selling, some months ago made a survey to determine what portion of its system was chiefly at fault for a gradually decreasing consumption per domestic gas user. On the basis of the facts revealed the company began direct-selling of certain gas appliances in sections of its territory.

It is significant that one effect of this direct-selling was to increase dealer sales in the sections affected, as reported elsewhere in this issue.

Improve Oil for Gas Making

A PRIMARY obstacle to maximum efficiency in the manufacture of gas from oil has long been found in the unsuitable quality of oil furnished for the purpose by petroleum companies. Refuse oil from refinery processes, now supplied to gas companies for gas making, leaves much to be desired in quality, being in many cases high in asphaltic compounds and constituents which gasify poorly and do not yield reasonable volumes of fixed gases. Maximum volumes of gas per volume of oil cannot be made from such oils, no matter how efficient the generating plant and practice may be.

Standard specifications being lacking, different shipments of oil are found to vary in almost every characteristic except the name. Gas companies have it in their power to change this situation by developing specifications for oil, and then insisting upon oil companies complying with them. But the unfortunate present fact is that gas companies are unable to write adequate specifications for gas making oil. This matter has fittingly been made the subject of investigation of a newly formed committee in the Pacific Coast Gas Association's Technical Section. Gas company chemists will put their heads together to evolve standard specifications, and there is some thought that oil company chemists may be asked to sit in on the committee work.

Oil companies come in for censure in this matter. While they perhaps are not to be blamed for failing to do the gas company's job of developing specifications—though they are equally concerned in the proper use of their product—there are too frequent instances where oil containing injurious constituents has been supplied gas plants. Linings of generators have been destroyed by oil containing nickel compounds; oil containing 2½ per cent sulphur was supplied in one known case, making purification of the gas extremely difficult, excessively fouling oxide boxes, and causing consumer complaints due to H_2S odor. Absence of standard specifications will not excuse such overt offenses as these. It is to be hoped that oil company co-operation will be accorded gas companies in speedily improving this situation.

Field of Association Service

AT LEAST five of the many benefits which result from trade association activity were listed by Geo. L. Ratcliffe, president of the California Natural Gasoline Association, in an address before that organization's fall meeting in November. While his remarks were applied to this particular group of natural gasoline men, they may as fittingly be used as a generalization of what association activity may accomplish when properly directed. These were the lines of service named by Mr. Ratcliffe:

Improving and perfecting apparatus, equipment and processes of manufacture.

Eliminating waste and duplication of effort.

Recommending uniform methods, specifications, tests, etc.

Stimulating thought and effort of individual members of the industry.

Eliminating hostility, suspicion and distrust which is apt to develop between those competing in the industry when there is no common point of contact.

Certainly these apply in their entirety to the natural gasoline industry—young offshoot of the gas and petroleum industries. We venture that the same remarks can be as well applied to the gas industry, even to the last item, for non-competitive as are gas utilities, they have been known to hoard the benefits of their accumulated individual experiences, technical, merchandising, and otherwise, until "association-mindedness" developed to a point making interchange of knowledge possible.

The Effect *of* Barometric Pressure *on* Orifice Meter Measurements

By B. M. LAULHERE
and
W. M. YOUNG

"IT is time that a standard absolute pressure base should be adopted for use in establishing the unit of measurement," say the authors of this paper, read by Mr. Laulhere before the Tuesday morning session of the California Natural Gasoline Association's fall meeting, November 15. Practical effects of varying barometric pressures are discussed in the report, which urges the need of an absolute pressure base in the interests of good gas accounting, and to make possible accurate computation of pipe line losses and plant efficiencies.

Mr. Laulhere is with the Southern California Gas Company, and Mr. Young the California Gasoline Company.

1. BAROMETRIC PRESSURE AND THE UNIT OF MEASUREMENT

IN orifice meter measurement, two absolute pressures must be definitely established. The first is the absolute base pressure, to be used in establishing the unit of measurement, and the other is the absolute pressure of the gas in the meter. The first is an arbitrary pressure, the second an actual one. The base pressure may or may not be selected with reference to the barometric pressure at the point of measurement. However, to obtain accurate volumes the average barometric pressure at the point of measurement must be known, in order to establish the absolute pressure of the flowing gas.

The unit of gas measurement is referred to an absolute pressure base, which is usually designated in pounds per square inch. This absolute pressure base is usually fixed as a certain number of ounces above the average barometric pressure at the point of measurement. Until recently, it has been standard practice to consider the average barometric pressure as 14.4 pounds per square inch, which is due to the fact that this value is representative of the average barometric pressure of most of the gas fields in the United States. To this barometric pressure a pressure base usually expressed in ounces was added, to arrive at the absolute pressure base to be used in establishing the unit of measurement.

In recent years however, gas fields have been developed where the average barometric pressure varied both above and below 14.4 pounds per square inch, in fact, ranging from about 11.9 pounds per square inch to 14.7 pounds per square inch. With the development of gas in these fields, it became customary to use the average barometric pressure in these localities, plus a certain number of ounces (usually 4 ounces) as the absolute pressure base to be used in determining the unit of measurement.

The unit of measurement established in this manner varies with the barometric pressure at the point of measurement, and the results obtained are comparable only with measurements made at localities having the same barometric pressures.

For example, assume a pipe line where the average barometric pressure at one end is 14.4 pounds per square inch, and at the other end 11.4 pounds per square inch. At both ends a pressure base of 4 ounces is used, giving absolute pressure bases of 14.65 and 11.65 pounds per square inch respectively, at the lower and upper ends of the line. Using these values in the coefficients, for measuring at each end of the line, will obviously give different volumes. A coefficient calculated on an absolute pressure base of 11.65 pounds per square inch at the upper end of the line, results in a volume approximately 20 per cent greater than the measurement obtained by using an absolute pressure base of 14.65 pounds per square inch at the lower end of the line. It is evident, that if more gas is measured out of the line than is measured into it, the units of measurement must be different. In other words, the cubic foot used to measure the gas in is different from the cubic foot used to measure the gas out; hence the results obtained when different absolute pressure bases are used are not comparable. It is readily seen that if the average barometric pressure is used in calculating coefficients for meters at different elevations, it is impossible to compute pipe line losses without making corrections for these differences. This fact also holds true when calculating plant efficiencies. In some districts of Southern California as many as three units of measurement are in use in the same field; these are based on absolute pressures ranging from 14.65 pounds per square inch to 14.9 pounds per square inch. In fact, they are in use on the gathering system of one compressor station. The maximum error, or rather the difference due to the use of the various units of measurement in this case is 1.7 per cent. This leads to many difficulties, not only in arriving at losses on pipe line systems and through plants, but also in gas accounting, which is becoming more and more complicated.

EFFECT ON FUEL COMPARISONS

Since the weight of a unit volume of gas does not change, and neither does its heat content, it is apparent that through the use of different units of measurement the unit volume will change and the heat content per unit volume will be different. Therefore, in making comparisons between gas and other fuels, it is necessary to know the absolute pressure base used in establishing the unit of measurement. The importance of this, when making comparisons with other fuels, is best illustrated by an example:

A gas measured, using an absolute pressure of 14.73 pounds per square inch and 60° Fahr. temperature, to establish the unit of meausrement, contained 960 B.t.u. per cubic foot. The same gas measured, using an absolute pressure of 12.28 pounds per square inch and 60° Fahr. temperature, to establish the unit of measurement, will contain 800 B.t.u. per cubic foot. Assuming a barrel of oil to contain 4,800,000 B.t.u., this would be equivalent to 6,000 cubic feet of gas, measured at an absolute pressure base of 12.28 pounds per square inch, and 5,000 cubic feet of gas measured at an absolute pressure base of 14.73 pounds per square inch. It is evident that in making comparisons between gas and other fuels that proper thought must be given to the unit of measurement, to which the gas is referred, since the heat content of liquid fuel is the same at any altitude.

In establishing the unit of measurement, in this case the cubic foot, two conditions must be known. The first is the base temperature to which our standard cubic foot is to be referred, and the second is the absolute pressure to which this unit of measurement is to be re-

ferred. Regarding the first condition, the accepted base temperature with very few exceptions is 60° Fahr. In all gas measurement work great care has always been taken to refer the flowing temperature to the standard base temperature by making the necessary connections. Regarding the second, there seems to have been a great deal of confusion or misunderstanding as to how the barometric pressure affected orifice meter measurement.

There has apparently been a misunderstanding that in order to make volumes comparable, the coefficients should be corrected for changes in barometric pressures.

Since all gas measurements are referred to as 60° Fahr. (520° Abs.) temperature, irrespective of atmospheric temperature at the point of measurement, it does not seem logical to change the absolute pressure base to conform to barometric pressures at the point of measurement.

STANDARD ABSOLUTE PRESSURE BASE NEEDED

It is time that a standard absolute pressure base should be adopted for use in establishing the unit of measurement, and eliminate many of the misunderstandings that have existed up to the present time. The accepted pressure standard now used in gas testing work is 30 inches of mercury (14.73 pounds per square inch) and 60° Fahr. temperature. This standard is also used for the measurement of manufactured gas. There seems to be no reason why a different standard should be used for the measurement of natural gas, and the following resolution was adopted by the Pacific Coast Gas Association at its annual convention at Santa Cruz last September:

Whereas: the present practice in the natural gas industry of basing gas measurements by means of orifice meter on the barometric pressure at the point of measurement, tends to induce inaccuracy and complicate orifice meter measurement, and

Whereas: It would be desirable to have a uniform pressure datum for gas measurement throughout the gas industry, and,

Whereas: A pressure datum of 14.73 pounds per square inch has been established and is universally used in the manufactured gas industry and in testing work, be it therefore resolved: That in orifice meter work a standard pressure of 14.733 pounds be recommended for use by all member companies and their associates in the natural gas industry.

2. THE EFFECT OF BAROMETRIC PRESSURE ON PRESSURE EXTENSIONS

The barometric pressure, however, does have an important bearing on the measurement of gas, but only after the unit of measurement has been established.

The formula used for calculating the flow of gas through an orifice meter is:

$$Q = C\sqrt{Ph}$$

in which

Q=The quantity of gas passing the orifice in cubic feet per hour

C=A coefficient, depending on the specific gravity of the gas, its temperature, size of pipe, size of orifice, location of pressure connections, etc.

P=Absolute pressure of the flowing gas.

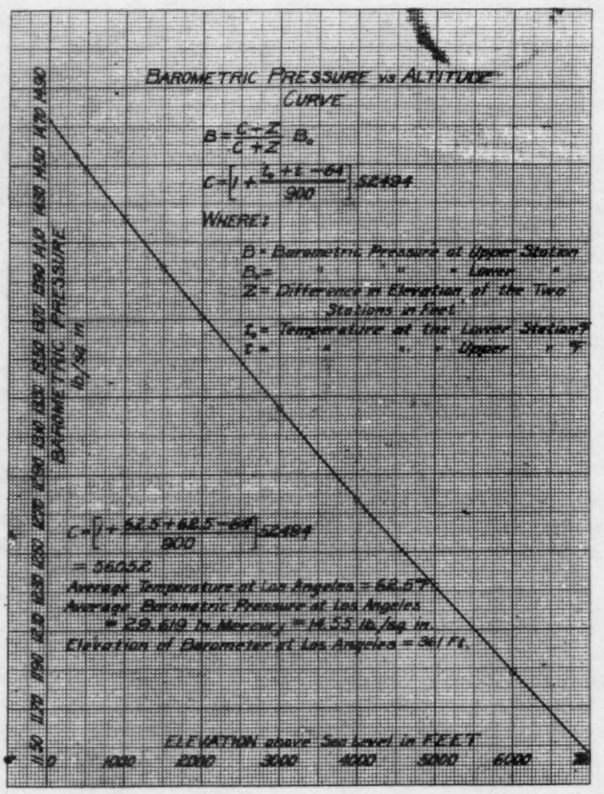

BAROMETRIC PRESSURE vs ALTITUDE CURVE
B = Barometric Pressure at Upper Station
Z = Difference in Elevation of the Two Stations in Feet
Average Temperature at Los Angeles = 62.5°
Average Barometric Pressure at Los Angeles = 29.619 In. Mercury = 14.55 lb./sq. in.
Elevation of Barometer at Los Angeles = 341 Ft.
BAROMETRIC PRESSURE lb./sq. in.
ELEVATION above Sea Level in FEET
0
1000
2000
3000
4000
5000
6000

Fig. 1

h=Drop in pressure across the orifice in inches of water.

The absolute pressure, P, is the sum of the gauge pressure and the barometric pressure at the point of measurement.

The present pressure extension tables are based on a barometric pressure of 14.4 pounds per square inch; therefore, in order to obtain correct results, a correction must be applied to the volumes calculated, when using these tables, if the barometric pressure at the point of measurement is other than 14.4 pounds per square inch.

This error becomes greater as the difference between the barometric pressure at the point of measurement and 14.4 increases; but it decreases rapidly as the pressure increases. However, when measuring gas at very low gauge pressures or at a partial vacuum, the error is considerable.

The following tables show the error when measuring gas at various pressures, and different barometric pressures, at the point of measurement when the volumes have been calculated using pressure extensions based on a barometric pressure of 14.4 pounds per square inch.

Barometric pressure at point of measurement 14.73 lbs. per sq. in.

Pressure	Error
20-in. Vacuum	3.5% low
10-in. Vacuum	1.6% low
0 lb Gauge	1.15% low
5 lb Gauge	.85% low
25 lb Gauge	.4% low
50 lb Gauge	.25% low
100 lb Gauge	.15% low

Barometric Pressure at point of measurement 14.6 lbs. per sq. in.

Pressure	Error
20-in. Vacuum	2.2 % low
10-in. Vacuum	1.0 % low
0 lb Gauge	0.7 % low
5 lb Gauge	0.5 % low
25 lb Gauge	0.25% low
50 lb Gauge	0.2 % low
100 lb Gauge	0.1 % low

Barometric Pressure at point of measurement 14 lbs. per sq. in.

Pressure	Error
20-in. Vacuum	4.45% high
10-in. Vacuum	1.9 % high
0 lb Gauge	1.4 % high
5 lb Gauge	1.05% high
25 lb Gauge	0.5 % high
50 lb Gauge	0.3 % high
100 lb Gauge	0.15% high

Barometric Pressure at point of measurement 13 lbs. per sq. in.

Pressure	Error
20-in. Vacuum	16.3% high
10-in. Vacuum	6.9% high
0 lb Gauge	5.0% high
5 lb Gauge	3.7% high
25 lb Gauge	1.8% high
50 lb Gauge	1.1% high
100 lb Gauge	0.6% high

Barometric Pressure at point of measurement 12 lbs. per sq. in.

Pressure	Error
20-in. Vacuum	16.3% high
10-in. Vacuum	14.1% high
0 lb Gauge	8.7% high
5 lb Gauge	6.4% high
25 lb Gauge	3.0% high
50 lb Gauge	1.9% high
100 lb Gauge	1.1% high

It is apparent that the error caused by the use of these tables, at elevations where the barometric pressure is other than 14.4 pounds per square inch, is of great importance since it is not compensating.

If the barometric pressure at the point of measurement is greater than 14.4 pounds per square inch, the volume resulting from the use of pressure extension tables based on 14.4 pounds is less than the true volume, and greater than the true volume if the barometric pressure at the point of measurement is less than 14.4 pounds.

The correction to apply to the volume, obtained by the use of pressure extension tables in order to correct for the actual barometric pressure at the point of measurement is:

$$\text{Multiplier} = \sqrt{\frac{\text{Gauge Press.} + \text{Baro. at point of measurement.}}{\text{GAUGE PRESS.} + 14.4}}$$

A method of making this correction that saves any calculation, and also

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Natural Gas *in* Alberta, Canada

By C. J. YORATH

President The Canadian Western Natural Gas, Light, Heat and Power Company, Calgary; President Northwestern Utilities Limited, Edmonton

NATURAL gas is transmitted over considerable distances to serve domestic users and industry in communities of the Province of Alberta, which has become the largest gas producing area in the Dominion of Canada.

Among interesting features of natural gas service in Alberta are the scrubbing of Turner Valley gas for sulphur removal, and the extreme and rapid variation in temperature in sections such as Calgary. Gas is largely given over to domestic use in Alberta, its utilization being controlled by the Board of Public Utility Commissioners under Dominion Government supervision.

J. C. Yorath, a leader among Dominion utility men, delivered the paper which is reproduced in part on these pages, at a recent meeting of the Mining & Metallurgical Society.

UNTIL two years ago Ontario led the Dominion in its production of Natural Gas, but within the last two years Alberta has leapt to the fore, and so far surpassed the production of the Eastern province that its development of this natural resource ranks first by a wide margin. It will be seen that with its small population in comparison to its area (about 252,925 square miles) Alberta's residents and industries are assured of a natural gas supply for many years to come.

A large area in Alberta has already been proven up, and an enormous quantity of gas is now available at the surface. Geologists, however, are of the opinion that there is a still greater area which has not been thoroughly tested, but which is very favorable for the accumulation of natural gas.

There are now four wells producing crude naptha in the Turner Valley field, but the delivery of Royalite Number 4, remains overwhelmingly greater than the others, greater, in fact, than any other well of this description in the world. Perhaps the most amazing, yet gratifying feature of this "wonder" well is that after producing steadily for approximately three years, the last two of which it supplied Calgary with practically all of the natural gas used in that city, there is no diminution in the flow.

The Dominion Government Engineers report that the Natural Gas output at Royalite Number 4 increased from 9,119,500,000 cubic feet in 1925 to 10,418,697,000 cubic feet in 1926.

In the Southern part of Alberta, the cities of Calgary and Lethbridge and the towns along the main transmission lines are supplied with natural gas by the Canadian Western Natural Gas, Light, Heat and Power Company, Limited, both for domestic and industrial use, from its fields at Bow Island and Foremost, and in addition the Company purchases gas produced in Turner Valley, from the Royalite Company.

This company was organized in 1911 and immediately thereafter it developed the Bow Island field, the wells of which had an open flow capacity of 150,000,000 cubic feet per day. The length of the transmission line from Bow Island is 180 miles. The gas in this field began to peter out in the year 1918 and in consequence the Company had to develop another field at Foremost and construct a further 40 miles of transmission lines, so that the field could be connected to the main transmission line of the Company. So far, seven wells have been drilled in this field, No. 8 has recently been commenced, six of these are producers, and the total open flow of this field is 59,694,000 cubic feet per day.

USE TURNER VALLEY GAS

In 1925, in order to make use of the gas at Turner Valley, after the gasoline had been extracted by the Royalite Company, the Canadian Western Natural Gas, Light, Heat and Power Company, Limited, entered into a contract whereby it agreed to take all the gas from this field, thereby keeping in reserve for future use the gas in its other fields. At present, approximately 18,000,000 cubic feet per day can be obtained from Turner Valley, which is more than sufficient to supply all the industries of the above cities during the summer months, but during the winter months, the supply from this field has to be augmented from the other fields for the reason that the peak load varies from 25,000,000 to 34,000,000 cubic feet per day. At present, practically all the industries in Calgary are supplied with gas at an average rate of .17c per M cubic feet, and this price enables industries to use gas and save money compared with the cost of using any other fuel.

A new transmission line 40 miles in length and 10 inches in diameter was laid from Turner Valley to Calgary which provides a duplicate transmission line, and ensures a sufficient supply of gas at all times.

The total number of consumers served by the Canadian Western Natural Gas, Light, Heat and Power Company, Limited, in the southern part of the province is 15,460.

SERVICE IN NORTHERN ALBERTA

The City of Edmonton and the towns of Viking, Bruce, Holden, Ryley and Tofield, in the northern part of the Province, are supplied with gas by the Northwestern Utilities Limited, from its field at Viking, located approximately 80 miles East of Edmonton. Up to the present 14 wells have been drilled in the Viking field to an approximate depth of 2,100 feet and all have produced gas. The total open flow in this field is 69,733,000 cubic feet. The peak daily load of this Company is approximately 15,000,000 cubic feet, so that an ample supply of gas is available. It is estimated that the area of the gas field which has already been developed, is sufficient to supply these communities with gas for domestic purposes for at least 20 years, and it is estimated that when the field is extended by further drilling of wells, a large area will be proven up and the quantity of gas available will be greatly increased.

The number of consumers served by the Company has been increased from 1,880 at the beginning of 1924 to 7,450 at the present time.

In the Peace River country, which is approximately 300 miles northwest of Edmonton, considerable drilling has been carried on and large gas producing wells have been brought in, but up to the present there is no market for this gas, as there are no large urban centers in the immediate vicinity.

The City of Medicine Hat field has been producing for several years and so far has shown no decline. This is the only municipality owned natural gas property in the Province.

ESTABLISHING GAS RESERVES

It is the duty of all gas companies to establish reserves of gas well ahead of their demands, and with this purpose in

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P. G. *and* E. Outlines Creative Selling Program

SOME months ago the Pacific Gas and Electric Company inaugurated a plan which was fittingly termed "creative selling"—which took the form of direct campaigning on water heaters and ranges in outlying sections of the company's Northern California system. This activity affects ten per cent of the P. G. and E.'s consumers, located in smaller towns of the utility's territory.

Certain fundamental facts underlie this entrance into "creative selling," and the Western gas industry has awaited with an unusual degree of interest a definite statement from the company, which would clarify the issues and make available to the industry information on such salient problems as that of decreasing consumption per domestic user. P. G. and E. experiences in this regard doubtless have wide application elsewhere throughout the country.

A discussion before the general sessions of the Pacific Coast Gas Association regional meeting last month at San Francisco by F. U. Naylor, manager of gas sales for the Pacific Gas and Electric Company, has provided the desired background behind the direct selling the company has been sponsoring in recent months, and *Western Gas* takes this opportunity to present the information contained in Mr. Naylor's remarks. Much of it is given in outline form, as sent us by Mr. Naylor, with such amplification as seems desirable.

DEALER JOB INADEQUATE

In the first place, the company makes it clear that the present policy is entered upon because of the failure of local dealers in the sections concerned to do a "complete job" of gas appliance merchandising. The gas company holds to its settled policy favoring exclusive dealer selling of gas merchandise in those sections where adequate results are being achieved, and the company's estimate of what results are to be viewed as *adequate* is the one which governs the situation.

It was not a casual decision which the P. G. and E. made in adopting direct selling in parts of its system. A thorough analysis of factors regulating present and future sale of gas appliances was made, and the conclusion reached that a redoubling of effort will be necessary to push modern gas appliance sales in the face of the increasingly strong specialty selling being done in the interests of radio, the automobile, and similar commodities. Other general influences on the situation, such as the trend toward apartment house living, which are taking gas out of its basic field, the home, were also thrown into the scale.

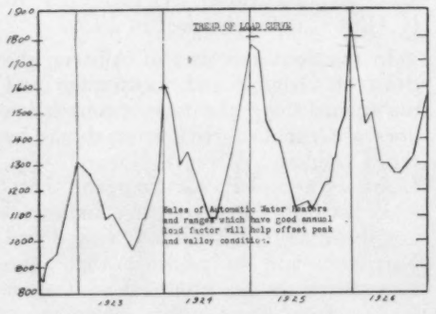

Figure 1

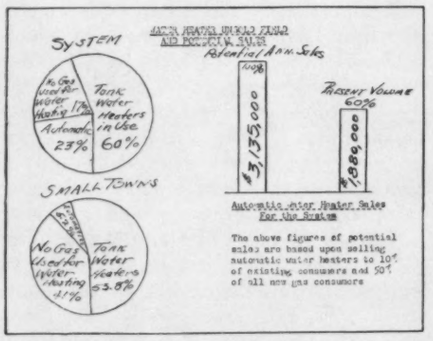
SYSTEM
Potential Ann. Sales
Present Volume
60%
Tank Water Heaters in Use 60%
SMALL TOWNS
Tank Water Heaters 53.8%
Automatic water Heater Sales For the System
The above figures of potential sales are based upon selling automatic water heaters to 10% of existing consumers and 50% of all new gas consumers

Figure 2

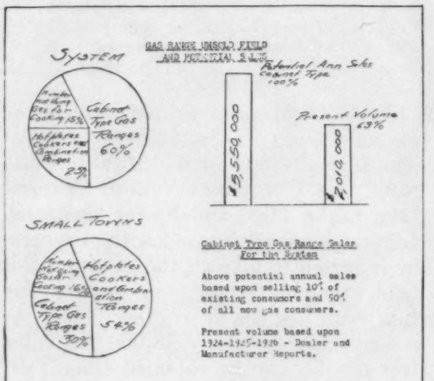
SYSTEM
Potential Ann. Sales
Present Volume
63%
Cabinet Type Gas Ranges 60%
SMALL TOWNS
Cabinet Type Gas Ranges 30%
Cabinet Type Gas Range Sales For the System
Above potential annual sales based upon selling 10% of existing consumers and 50% of all new gas consumers.
Present volume based upon 1924-1925-1926 - Dealer and Manufacturer Reports.

Figure 3

UNIT CONSUMPTION DROPS

Coming down to particulars, the company points to a gradual decline in average consumption per domestic consumer on its lines. The figures are these:

1924.....36,035 cu. ft. per domestic consumer
1925.....35,998 cu. ft. per domestic consumer
1926.....35,193 cu. ft. per domestic consumer

Since 1924 the loss in average annual consumption per consumer has amounted to 842 cubic feet. For 395,803 domestic consumers this represents an annual loss of 332,100,000 cubic feet, or a revenue of approximately $300,000, which makes it easy to understand why the company is candidly asking itself: "What will 1930 show?"

Another weighty element considered was the unsatisfactory trend in investment. Following are the figures on Pacific Gas and Electric Company investment in its gas business for the years 1922 to 1927, inclusive:

Year	Investment As of Dec. 31st	Investment Per Consumer	MCF Sales Per $1000 Invested
1922	$37,754,305	$119.00	339
1923	42,658,735	124.00	340
1924	46,489,882	127.00	343
1925	55,701,009	144.00	317
1926	62,362,774	149.00	296
1927 (Est.)	65,757,178	148.00	292

Also of significance is the trend of load curve, with its seasonal peaks and valleys, shown in Figure 1.

In an effort to get behind the manifest fact that consumption per domestic consumer is on the decrease, the P. G. and E. made a survey which covered 74,000 of its consumers, so selected as to present a true cross-section of the domestic problem. Conclusions with reference to two gas burning appliances of good annual load characteristic, the water heater and the range, are charted in Figure 2 and Figure 3, respectively. It will be noted from these figures that unsatisfactory tendencies shown for the whole system are exaggerated in the small towns. Thus, whereas over the system the figure on "no gas used for water heating" comes to 17 per cent, in the small towns the unsold water heater market is 41 per cent.

From the survey charted on Figure 2 the company estimates that selling automatic water heaters to the unsold consumers (17 per cent) would add $2,131,800 in annual company revenue.

If ranges were sold to all the unsold consumers (15 per cent) and half the hot plates were replaced with ranges, the estimate is that an increased annual company revenue of $2,340,000 would result.

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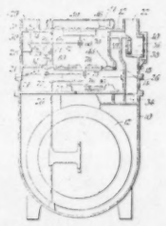
THIS MONTH'S PATENTS PERTAINING TO THE INDUSTRY

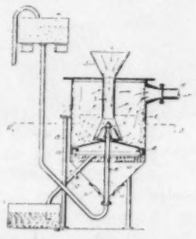
1,615,137. ART OF GAS DISTRIBUTION. Robert G. Griswold, Westfield, N. J., assignor to Doherty Research Company, New York, N. Y., a Corporation of Delaware. Filed Aug. 2, 1923. Serial No. 655,152. 15 Claims. (Cl. 73—1.)



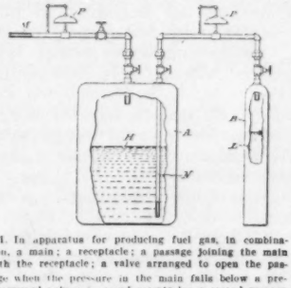
1. The combination of a casing having an inlet and outlet, a volumetric metering mechanism in said casing, means in said casing for normally maintaining constant gas pressure in said outlet, and demand limiting means also in said casing operating independently of said means and controlled at least in part by the drop in pressure across said volumetric mechanism.

1,637,597. APPARATUS FOR CLEANING, COLLECTING OR SEPARATING GASES. Gerardus Jacobus Ubbel, Dusseldorf, Grafenberg, Germany. Filed July 21, 1920, Serial No. 397,979, and in Germany Dec. 23, 1918. 4 Claims. (Cl. 261—112.)

3. In apparatus of the class described, a container, a gas distributer therein, an inlet pipe for conducting gas to said distributer, a baffle plate beneath said gas distributer, said gas distributer consisting of a conical shell having its small end connected to said inlet pipe, a conical member within said conical shell disposed so as to form an annular space or nozzle around the lower edge of said conical shell adapted to direct gas in a thin blast upon said baffle plate, and means for causing liquid to flow over said baffle plate the lower portion of said container being adapted to collect said liquid, said container having a gas outlet above said baffle plate and a liquid outlet below said baffle plate said liquid outlet being adapted to maintain the liquid at a constant level in said container.

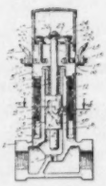


1,638,134. GAS APPARATUS. George O. Curme, Jr., and Harold E. Thompson, Clendenin, W. Va., assignors to Carbide and Carbon Chemicals Corporation, a Corporation of New York. Filed June 15, 1922. Serial No. 568,580. 2 Claims. (Cl. 48—190.)



1. In apparatus for producing fuel gas, in combination, a main; a receptacle; a passage joining the main with the receptacle; a valve arranged to open the passage when the pressure in the main falls below a predetermined value; a second receptacle; a second passage joining the second receptacle with the first receptacle; and a second valve arranged to open the second passage when the pressure in the first receptacle falls below a second predetermined pressure lower than the first.

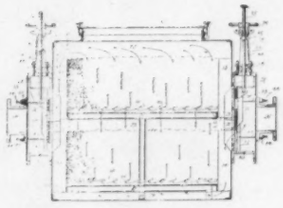
1,644,171. REMOTE GAS-CONTROL VALVE APPARATUS. Hendrix K. Caldwell, San Diego, Calif. Filed Oct. 11, 1923. Serial No. 667,831. 6 Claims. (Cl. 137—139.)



1. In an apparatus of the class described, a valve casing, an electro-magnet controlled valve member mounted therein, an electromagnet in connection with said valve member, and an electrical contact switch means in connection with said valve member, said electrical contact switch means serving as a multiple stop means for positioning said valve member in various extreme and intermediate positions relatively to and from its seat.

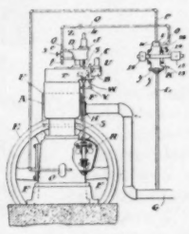
1,632,251. GAS-PURIFYING APPARATUS. Thomas W. Stone, Fort Wayne, Ind., assignor to Western Gas Construction Company, Fort Wayne, Ind., a Corporation of Indiana. Filed Feb. 16, 1922. Serial No. 536,882. 11 Claims. (Cl. 183—48.)

1. In a gas purifying apparatus, in combination; a purifying box provided with upper and lower tiers for supporting masses of a gas purifying agent and providing a gas passageway above the upper tier, a gas passageway below the lower tier and an intermediate gas passageway between said tiers; upper and lower gas flow channels located at the opposite ends of said boxes, the upper channels communicating only with the upper gas flow passageway and the lower channels communicating only with the lower gas flow passageway; a gas flow regulating means comprising a valve casing positioned at each end of the purifying box, each valve casing having



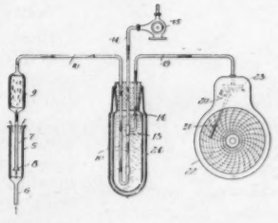
ports respectively communicating with the upper gas flow channel, the intermediate gas flow passageway and the lower gas flow channel, a valve body yieldingly held in juxtaposition with said ports and movable into positions for selectively opening any one of said ports, of the upper and lower ports simultaneously, and manually-controlled means for operating said valve body; substantially as specified.

1,632,349. GOVERNOR REGULATOR. Edward Rathbun, Toledo, Ohio, assignor to Ingersoll-Rand Company, Jersey City, N. J., a Corporation of New Jersey, and The Rathbun-Jones Engineering Company, Toledo, Ohio, a Corporation of Ohio. Filed Aug. 29, 1926. Serial No. 131,660. 5 Claims. (Cl. 230—3.)



1. A governor regulator for the centrifugal governor of an engine driven compressor or pump unit, comprising a regulating device responsive to pressure from the source of pressure fluid supplied by the unit and to be maintained at substantially constant pressure by varying the speed of the engine, a source of oil under pressure and connections from said source to the regulating device controlled by said device, and a controlling device operated by said oil under pressure and adapted to vary the load on the governor, said controlling device comprising a casing, a stem movable in the lower portion of the casing and supported on the governor push rod, a compression spring supported by said stem, and a hollow piston carried by said spring, whereby variations in pressure in the source of pressure fluid supplied by the compressor unit, cause the said controlling device to change the characteristics of the governor, which in turn varies the speed of the engine as required.

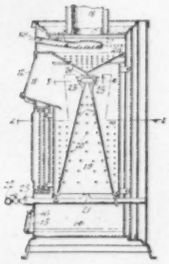
1,633,352. GAS-ANALYSIS APPARATUS. Kenneth L. Tate, Rochester, N. Y., assignor to Taylor Instrument Companies, Rochester, N. Y., a Corporation of New York. Filed Feb. 23, 1926. Serial No. 90,021. 15 Claims. (Cl. 265—44.)



1. A gas analysis apparatus comprising a chamber having a capillary inlet passage adapted to be supplied with a mixture of gases including one or more component gases the quantity of which is to be measured, a restricted outlet passage for said chamber, means for maintaining a predetermined difference in the pressures to which said passages are externally subjected, one of said passages being constructed relative to the other and to said pressures to maintain a pressure between opposite sides thereof adapted to maintain a rate of flow therethrough substantially independent of fluctuations in the external pressure thereon, and a pressure sensitive device communicating with said chamber and having a part movable in response to the pressure therein as a function of the quantity of said gas or gases to be measured in said gaseous mixture.

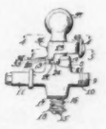
1,645,863. INCINERATOR. Edward Kever, Jr., Buffalo, N. Y., assignor to Buffalo Co-Operative Stove Co., Buffalo, N. Y., a Corporation of New York. Filed Feb. 7, 1924. Serial No. 691,694. 1 Claim. (Cl. 110—18.)

A refuse incinerator comprising a receptacle adapted to receive the material to be burned, an upright upwardly tapering tube arranged centrally within the receptacle and provided at its lower large end with an inlet for gaseous fuel, an outlet at its small upper end and a plurality of perforations in its side at different places throughout the height thereof, and a baffle of comparatively small diameter arranged horizontally above the upper end of said tube and close thereto, and projecting laterally beyond said upper outlet so as to de-



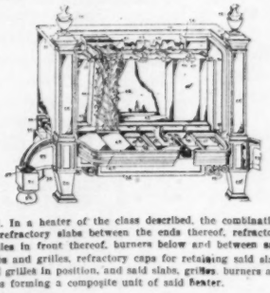
flect the gas issuing therefrom horizontally over the top of the material and burn over the latter immediately around said tube.

1,644,578. SAFETY-PLUG LOCK FOR GAS COCKS. John H. Gronce, Philadelphia, Pa. Filed July 31, 1923. Serial No. 654,800. 5 Claims. (Cl. 251—164.)



1. In a gas cock valve, a valve body having a recess in its upper end, a valve member movable in said body, a pin in the valve member limiting movement of the valve by engagement with a wall of the recess and a fastening device carried by the valve member, comprising a spring pressed pin passing through the valve member and a lock carried by one end of the pin, enclosing the valve element and pressed by the spring toward position for engagement with a wall of the recess, the lock being adapted to fill in the space between this wall of the recess and the pin in the closed position of the valve and for thumb engagement to release it.

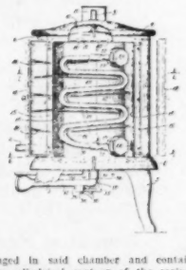
1,642,111. GAS HEATER. Walter Kennedy, New York, N. Y., assignor, by mesne assignments, to Kennedy-Toombs, Inc., a Corporation of New York. Filed Feb. 16, 1921. Serial No. 445,362. 6 Claims. (Cl. 126—92.)



1. In a heater of the class described, the combination of refractory slabs between the ends thereof, refractory grilles in front thereof, burners below and between said slabs and grilles, refractory caps for retaining said slabs and grilles in position, and said slabs, grilles, burners and caps forming a composite unit of said heater.

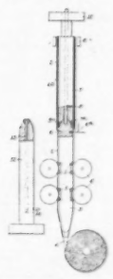
1,639,748. WATER HEATER. Henry W. O'Dowd, Jersey City, N. J., assignor, by mesne assignments, to Standard Gas Equipment Corporation, Baltimore, Md., a Corporation of Maryland. Filed May 23, 1924. Serial No. 715,285. 8 Claims. (Cl. 122—14.)

1. A water heater including in combination a cylindrical storage tank, a cylindrical casing surrounding and spaced from said tank and formed in one side with a recess constituting a shallow segmentally-shaped combustion chamber, a cover for said chamber forming a curved continuation of the casing, a water circulating



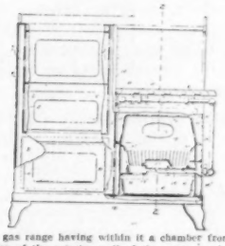
coil arranged in said chamber and contained wholly within the cylindrical contour of the casing and communicating at its ends with the interior of the tank, and means for generating heat in said chamber.

1,639,682. GAS MANTLE AND METHOD OF MAKING THE SAME. Carl E. Bliss and Francis A. Wegener, Gloucester, N. J., assignors to Welsbach Company, Gloucester, N. J., a Corporation of New Jersey. Filed July 6, 1921. Serial No. 482,093. 6 Claims. (Cl. 67—100.)



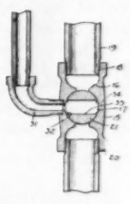
1. As a new article of manufacture, an upright mantle formed of tubular meshed fabric with an upper end portion of gradually decreasing diameter and having the meshes of the portion of decreasing diameter correspondingly contracted whereby any gathering in that portion of the fabric is avoided, and a supporting ring having a cross bar at the most restricted portion of the mantle, the fabric at the most restricted portion of the mantle being turned inwardly about the ring to reinforce the upper part of the fabric of the mantle, the bar passing through the fold of the fabric.

1,645,784. GAS RANGE. Samuel A. Wilde, Taunton, Mass., assignor to Glenwood Range Company, Taunton, Mass., a Corporation of Massachusetts. Filed Jan. 24, 1927. Serial No. 162,969. 7 Claims. (Cl. 126—39.)



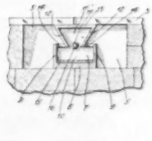
1. A gas range having within it a chamber fronted by a portion of the exterior wall of the range, an incinerator casing with dome arranged within said chamber making closed connection with a portion of the front wall of said chamber with smoke pipe leading outwardly through said chamber, said dome having an opening through it, an incinerator located inside the enclosure of said casing and dome, means whereby access may be had to the incinerator and air admitted thereto through that portion of the exterior wall of the range fronting the incinerator casing, means whereby access may be had to the dome of the incinerator casing through the exterior wall of the range fronting said chamber, and a movable door closing the opening through said dome.

1,639,431. GAS-CONTROL COCK. Hugh B. Hatton, Jr., Glendale, Calif. Filed Apr. 29, 1926. Serial No. 105,551. 7 Claims. (Cl. 251—165.)



2. A gas control cock comprising a body adapted to be connected in a gas supply line to a building having a duct therethrough, a valve seat in the walls of the duct, a vent port in the valve seat, a vent pipe communicating with the vent port, a valve rotatable in the valve seat having a port therein to aline with the duct when in open position and to aline with the vent port when in closed position whereby leakage of gas past the valve will be vented to atmosphere through the vent pipe, to thereby prevent the passage of gas into the pipe line beyond the valve.

1,632,492. HUMIDIFIER FOR OVENS. Sally Mayer and Hermann Nahmstedt, St. Louis, Mo. Filed Mar. 15, 1926. Serial No. 94,707. 5 Claims. (Cl. 107—64.)



1. In a bake oven, the combination with a fire chamber and an oven with an intermediate horizontally disposed wall therebetween, of a chamber formed in said wall, a humidifying device mounted in said chamber comprising a trough portion and a dome portion with intermediate outlet passages, a spray pipe connected into said humidifying device, and means for controlling the supply of liquid to said spray pipe.

A comparison of domestic consumption in large centers with that in small communities is further evidence of the need for merchandising stimulus in small towns. This comparison, unfavorable to the small town appliance situation, is shown in Table I.

Table I. Comparison of Consumption Per Domestic Consumer in Large Divisions and Small Divisions—1926

Division	Avge. Consumption Per Domestic Consumer
San Francisco	34,024 Cu. Ft.
East Bay	37,895 Cu. Ft.
Sacramento	41,705 Cu. Ft.
San Jose	34,185 Cu. Ft.
Fresno	36,489 Cu. Ft.
Total No. Consumers—363,688.	
Avge. Consumption Per Consumer—35,828.	
Colgate	29,621 Cu. Ft.
De Sabla	24,939 Cu. Ft.
Drum	17,169 Cu. Ft.
North Bay	28,445 Cu. Ft.
San Joaquin	24,204 Cu. Ft.
Shasta	23,571 Cu. Ft.
West Side	26,512 Cu. Ft.
Total No. Consumers—32,115.	
Avge. Consumption Per Consumer—27,545.	
System Total No. of Consumers—395,803.	
Avge. Consumption Per Consumer—35,193.	

All of these facts on dwindling consumption reduce down to the amount of effort dealers have expended in pushing gas appliances. From some years of close association in co-operative merchandising work with dealers, in large centers and small, the Pacific Gas and Electric Company makes the following observations on dealer activity and dealer effectiveness in selling gas appliances as specialties:

Dealer Activity and Gas Appliance Selling as a Specialty

1. Automatic Water Heaters
   San Francisco and East Bay Dealers
   A. Store Selling—Good specialty selling.
   B. Outside Selling—New houses, good Old houses, none.
   Smaller cities and towns
   A. Store Selling—Order taking only.
   B. Outside Selling—Order taking, no sales effort on new or old houses.
2. Modern Gas Ranges
   Large city dealers
   A. Store Selling—Good, but emphasize price, no modern features.
   B. Outside Selling—New Houses—Range selling is incidental and secondary to present general effort.
   Old Houses—None.
   Apartment Houses—None.
   Smaller cities and towns
   A. Store Selling—Fair—Emphasize price.
   B. Outside Selling—None.
3. Gas Range and Water Heater *Specialty* Selling:
   Household necessities that should be advertised and sold as specialties, not on price.
   Examples of other domestic specialty appliance selling are Vacuum Cleaners, Washing Machines and Electric Ranges.

Because the company has been engaged since 1921 in a program of co-operation with dealers through the medium of the Gas Appliance Society and in other channels, it desires its present stand for "creative selling" to be clearly understood. The following outline gives the facts on the P. G. and E.'s co-operative policy:

P. G. and E. Dealer Co-operative Policy

A. *"P. G. and E. has believed and does believe local dealer proper agent* to sell Domestic Appliances wherever possible. P. G. and E. retired from sales of Domestice Appliances and gave dealer full opportunity to sell these. Right was reserved, however, for company to re-engage wherever and whenever local dealers were not doing complete job. P. G. and E. to be the judge."—Extract, Mr. Creed's talk Gas Lab. 1923.

B. *How P. G. and E. Has Fostered this Policy*:
   1. Policy applied in all cities and towns as soon as dealers were prepared.
   2. Co-operated in organizing Gas Appliance Society as medium to assist all dealers.
   3. At unit G. A. S. meetings put on Educational, Sales and Service Talks.
   4. Actively and financially supported local unit G. A. S. activity.
   5. Special Spring G. A. S. State Campaign liberally financed and aided
   6. Urged jobbers and manufacturers to help dealers cash in on full opportunity.
   7. Financial underwriting jobbers and manufacturers dealer assistance.
   8. Tried financial underwriting city local dealers in creative selling.
   9. P. G. and E. newspaper advertising and special booklets, supporting local dealers and selling "idea." Cost $50,000 a year for *Gas* only.
   10. Window trims and floor displays offered dealers.
   11. P. G. and E. employed salesmen to generally develop gas appliance sales and aid dealers. Cost $75,000 a year.

The following expression of the Pacific Gas and Electric Company's attitude on the merchandising situation which has prompted the introduction of "creative selling" will interest dealers and gas company readers alike:

Observations on Beginning "Creative Selling"

1. Local dealer store selling reaching normal volume sales is generally satisfactory.
2. In larger cities we believe dealer's resources and ability will enable them to meet their responsibility and opportunity of specialty selling modern gas appliances.
3. In small cities and towns (representing less than 10 per cent of our customers) local dealers are not doing creative selling. They admit this, even with manufacturers' assistance.
4. P. G. and E., therefore, has fully advised, in general meetings and in person, small city dealers of our plans to re-engage in *creative* selling only.
5. *What* P. G. and E. Creative Selling Plan means:
   1. Recognition of dealers as proper agent for *store* selling of normal appliance business.
   2. Supplementing dealer store selling by our creative *field* selling.
   3. P. G. and E. pledges to adhere to ethical merchandise practices, maintain standard prices, with no abuse of trade-in allowance.
   4. P. G. and E. will set higher standard of local sales by our emphasis on quality modern appliances.
   5. P. G. and E. creative selling plans not arbitrarily made because we offered co-operative selling through local dealers.

In the opinion of the gas company the appliance dealers in localities affected by the company's field selling will benefit directly from this activity, and the opinion is based on the facts below. Examples are also given of specific cases in which dealer sales have doubled and more than doubled, following P. G. and E. direct selling:

Beneficial Results to Appliance Dealers

1. Eighty consumers interviewed per week per man. Sixteen prospects developed an average of four sales or less per week.
2. Direct consumer educational work selling the idea of the modern appliance; prospects developed naturally and preferably go to dealer in many cases.
3. Dealer is helped to sell more quality appliances by standards we set. Thus less competitive price selling by him.
4. P. G. and E. minimizes trade-in allowance; maximum 10 per cent; average 4 per cent.
5. P. G. and E. advertising will continue, concentrating on selling idea of modern appliances.
6. P. G. and E. sale of only popular makes of ranges and water heaters will create prospects, which dealer selling same line can benefit from.
7. P. G. and E. initiative and dealer activity in creative selling of modern gas appliances will benefit dealer sales by obtaining the annual volume of range and water heater sales that is reasonably possible and that is now only 62 per cent attained.

Examples of Results to Dealers

1. San Jose dealers sold in three months after our campaign more automatic water heaters than in preceding year.
2. In Redding after our campaign dealers sold as many water heaters in three months as in *one* year.
3. Within four months following our water heater campaign Santa Rosa dealer sold more water heaters than during *two* preceding years.
4. In Chico we sold 40 water heaters in two weeks, more than dealers sold in two years. This year we sold 81 automatic water heaters in six weeks, dealers' regular sales doubled.
5. Red Bluff and Willows dealer rate of water heater sales doubled after our campaign, which sold 44 automatic water heaters in two weeks. These local dealer range sales are now 50 per cent greater than a year ago and they say reflect results from our creative selling.
6. In East Bay *P. G. and E. Trial Plan* through four dealers developed more sales for dealers not engaging in plan than for dealers who had creative salesmen out. Range and water heater sales by all dealers reflected this field selling effort.
7. Roseville: P. G. and E. sales of ranges were only one-fourth total range sales. J. Breuner Company says we set a standard helping them to sell $170 ranges on average. Was quite a contrast to North Sacramento.
8. Lodi: P. G. and E. creative selling this year resulted in Henderson Brothers range sales being doubled.

Concluding his discussion of Pacific Gas and Electric Company gas appliance selling policy, before the Pacific Coast Gas Association San Francisco meeting, Mr. Naylor reiterated the company's desire to be understood in its stand. While it has a definite policy of dealer co-operation, it is supplementing dealer store selling, in small towns, with creative and constructive field selling, exercising its option to enter the appliance field in self protection where the dealer is failing to realize his territory's reasonable possibilities. Given a fair trial, the P. G. and E. plan is expected to benefit store selling of gas appliances.

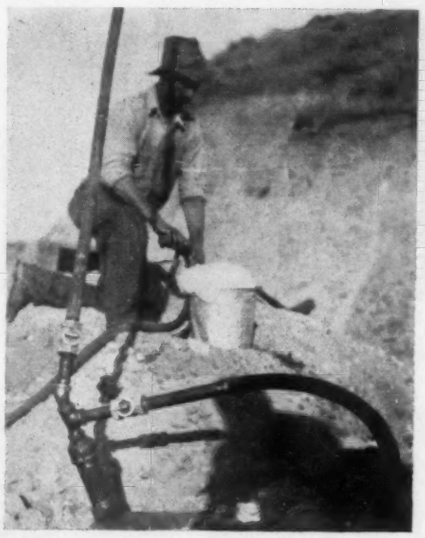
Setting a goal for future accomplishment, the P. G. and E. offers the following rough tabulation suggestive of the gain which should accrue to dealers and to company by

(Continued on Page 63)

Safe Practice *in* Purging Gas Mains

By W. M. Henderson

Superintendent of Gas Distribution
Los Angeles Gas and Electric Corp.



LEFT: *Taking sample of purge gas from gas main.* ABOVE: *Testing sample of purge gas by lighting soap bubbles*

UPON completing the installation of a gas main it is essential that the air content be purged to atmosphere before the new pipe can be safely used for the distribution of gas. This same precaution must be observed in placing in service storage tanks or gas holders.

The reason for purging the line is to prevent the air mixed gas passing to the balance of the distribution system from interfering with good gas service, or from remaining in the main as an explosive mixture with the possibility of ignition from some source by a flash back when a consumer attempts to light an appliance.

A small piece of main or a service pipe may be safely purged by blowing same to atmosphere and depending on the sense of smell to detect the presence of gas. In such cases there is so small a volume involved that inconvenience or harm will not result if all the air is not removed. However, it is the general practice to purge for a sufficient period to insure displacing all the air. The sense of sound is also a means for detecting the passage of the air from a pipe or container and its replacement by gas. Gas is lighter, volume for volume, than air, and under similar conditions will travel at higher velocity. Air passing through an orifice from the pipe to the atmosphere will register a certain sound, and as the gas comes, following the air, the sound will change to a bit shriller tone caused by the increased velocity at which the gas passes to the atmosphere.

Where large containers are involved the purging is a serious matter and should be done with caution by a method that will allow for a safe test for the presence of gas. Such a method was introduced years ago by E. C. Jones and should now be in general use, but I have met very few who practice his method. It is the usual thing to listen for the change in the note, or have faith that the nose knows. For the benefit of those who seek a safe and convenient way to purge, the following is offered:

A SIMPLE, YET CERTAIN, METHOD

Dissolve a piece of soap in a pail half full of water, stir well or until a froth is formed on the surface. Set the pail near the opening in the pipe line from which the purged air is issuing. When, in the judgment of an experienced gas man, the air has been displaced and gas is present, a test should then be made. Use a short piece of hose, about 20 ft. long, with a nipple or any suitable pipe thread, and connect the hose at the purge hole. Allow the purge gases to blow from the other end of the hose for a few moments, then submerge the end in the pail of soap suds and allow the gas to escape slowly, blowing a mass of soap bubbles on the surface of the pail. Shut off the issuing gas by kinking the hose, or other means—as a stop cock at the gas main; remove the hose from the pail and carry the pail, if necessary, to a safe location for the test. Light a match and toss it on the soap bubbles. If a slow burning illuminating flame results then the bubbles contain pure gas and the gas pipe is sufficiently purged. If a snappy fire, short blue flame, or evidence of an explosion occurs when the match hits the bubbles, then there is an air-gas mixture in the gas pipe, which is very dangerous, and the purging must be continued. If the match goes out without igniting the bubbles it indicates that air is still present in the gas main and further purging is necessary.

WHERE EXTRA CARE IS NEEDED

As a general rule, purging a gas main is a simple routine task, particularly on small sizes, six-inch pipe and less; usually such lines are installed and tied in with other lines so there is a circuit and a continuous movement of gas. There are cases, however, where the line is long and runs to a dead-end, or where the pipe is larger in diameter, or the pipe, run to the level of the ground surface, has a dip that is lower than the end of the line. Under such conditions a little extra precaution should be exercised to insure complete purging. It is observed in practice that air diffuses very slowly;—this is due to its greater density in comparison with gas. Under conditions as cited I have known cases where a line was purged and a good indication of gas secured, and yet trouble with air in the pipe was later experienced. One such case was a 16-inch line laid up a grade. Purging was done upon the completion of each 500 ft. of pipe, a two-inch tap serving as the purge hole. The velocity of the air and gas through the 16-inch line to issue through a 2-inch hole was not great, with the result that the gas passed over the air, though some diffusion took place. A few hours after the purge it was possible to go to the low points on the line and blow the drip risers and get pure air. Apparently during the slow rate of diffusion, the air, being heavier than the gas, was pushed back in the pipe as the light gas passed up to the higher elevation. Therefore, on large diameter pipe lines always test for gas at drip pot risers. The same tip holds good on long lines of pipe where street grades are excessive, leaving many valleys along the length of the pipe line. In such cases it is well to wait for an interval of about an hour or so after purging before testing the line at the low spots. This delay will allow the air, if any is present, to lodge in these low places.

DALLAS MEETING OF NATURAL GAS MEN—FEB. 6

The first general meeting of the Natural Gas Department of the American Gas Association since the amalgamation of the A. G. A. and the Natural Gas Association of America will be held the week of May 6, 1928, at Dallas, Texas, on the Texas State Fair grounds.

HEAT REGULATOR MERGER

Announcement was made in November of the consolidation of the Minneapolis Heat Regulator Company with the Honeywell Heating Specialties Company to form the Minneapolis-Honeywell Regulator Company.

30-MILE LINE TO ADD TO WICHITA GAS SUPPLY

Larutan Fuel Company, Larutan, Kan., has begun construction of a gas line from Conway Springs pool, 30 miles southwest of Wichita, to connect with the main running from northern Oklahoma to Wichita. Conway Springs pool has 70 gas wells making around 17,000,000 feet daily.

California Natural Gasoline Association men gathered at the banquet which concluded their Fall meeting held at Los Angeles in November

Fall Session *of* C. N. G. Ass'n *is* Big Success

CALIFORNIA'S enterprising natural gasoline industry turned out almost to a man when the California Natural Gasoline Association Fall Meeting convened in Los Angeles on November 15. The two-day session held at the Biltmore Hotel and terminating in a banquet and entertainment, drew an attendance in excess of 500, and was the most successful affair yet staged by the Association.

Geo. L. Ratcliffe of the General Petroleum Corporation, and president of the Association, called the first day's session to order at 9:30 Tuesday morning, and in his address gave an interesting review of the progress made by the Association to date in its brief but effective career of service to the natural gasoline industry. Mr. Ratcliffe's remarks on the present natural gasoline situation in California are printed in full on another page of this issue.

A paper on the "Proposed Tentative Standard Pressure Charcoal Test for Gasoline Content of Natural Gas," prepared by the gas testing committee of the Association, and presented by sub-chairman P. S. Magruder of the General Petroleum Corporation, followed the president's address. Discussion of this paper was led by W. W. Robinson, Jr., of the California Gasoline Company.

R. W. Garman, Union Oil Company of California, next read a paper entitled "Quality Survey of California Natural Gasoline," representing research of the specification committee of which he is chairman. This paper presented a short statistical report on California natural gasoline on the basis of Engler curves, and was illustrated with projected stereoptican slides of curves discussed. D. M. Wolfe, Standard Gasoline Company, led a limited discussion on Mr. Garman's paper.

A paper by Ben Laulhere of the Southern California Gas Company, which appears in full in this issue, was next in order. Fred S. Champion, Southern Counties Gas Company, was down to lead discussion on this topic, but passed up the privilege in favor of adjourning to lunch, as the hour was late. Mr. Laulhere's paper contained an important recommendation on the adoption of a uniform pressure base of 14.733 for use in natural gas measurement, in line with a similar recommendation of the Pacific Coast Gas Association made at its recent Santa Cruz convention.

Re-convening after lunch, with I. B. Funk, vice-president of the Association, acting as chairman, the natural gasoline men listened to a paper by C. W. Gard of the Union Oil Company of California, on "The Determination of Vapor-Tension of Volatile Liquids," discussion being led by F. S. Burt of the General Petroleum Corporation. This paper presented a comparison of the method proposed by C. P. Beistle, United States Bureau of Explosives, with the present Bureau of Explosives Standard Vapor-Tension Test for Gasoline.

"Analytical Gas and Gasoline Fractionation at Low Temperatures" was the next topic, handled by Lester O. Warner of Barton, Manning & Warner, consulting engineers. E. D. Cumming, Shell Company of California, led discussion. The paper defined the object of low temperature fractionation as being the separation of gas or gasoline into the actual chemical compounds, which are then accurately measured in a pure state.

Geo. F. Prussing, chairman of the petroleum section, National Safety Council, next gave a paper on "Safety and Fire Prevention in Natural Gasoline Plants," with B. F. Masten, Standard Gasoline Company, directing discussion. Mr. Pressing pointed out that safety in any branch of industry starts with the study of experience, goes through a phase of an engineering revision and ends in the education of personnel in safe practices. Facts were given to indicate that the majority of gasoline plant fires are preventable.

The paper entitled "Production of Natural Gasoline by the Conservation of Vapors" was presented by W. G. Palmer. Due to limited time no discussion was had. Approved methods for conserving vapors in field operations were outlined in this paper.

Wednesday morning and afternoon sessions were both given over to an address by Dr. George Granger Brown, Professor of Chemical Engineering at the University of Michigan, who for the past two years has directed a program of research on motor fuels for the Natural Gasoline Association of America. R. E. Beckley, Standard Gasoline Company, presided at the morning meeting, and H. W. Parmalee, California Gasoline Company, in the afternoon. The speaker was introduced by President Ratcliffe.

Dr. Brown's address commanded the peak of interest and received the close attention of refinery men, who were specially invited to sit in on the motor fuel sessions, as well as that of natural gasoline hearers. He brought indisputable evidence that natural gasoline is an indispensable constituent of a satisfactory motor fuel, with prospects of becoming more in demand in view of modern engine design, necessitating a constantly improved motor fuel.

The high point and almost startling factor brought out by Dr. Brown's address was this —that considerably heavier fractions can be advantageously used in gasoline motor fuels than is now the practice, providing sufficient additional natural gasoline is added to the fuel to give correct initial and 10 per cent-50 per cent effective volatilities. Such a change in the motor fuel composition as advocated by Dr. Brown would result in turn in a material increase in the percentage production of straight run gasoline cut from each barrel of crude run through the refinery and, furthermore, according to Dr. Brown, such a gasoline would be a material improvement over the average commercial product now marketed.

The high calibre of program attained in the Association's business sessions carried over into the banquet Wednesday evening, which was attended by some 460 men, with 500 or more present during the entertainment program following. President Ratcliffe introduced a number of visitors, among them Norman Pike, Pacific Coast representative of the American Petroleum Institute; Dr. Brown, speaker on the Wednesday program; and A. V. Borque, secretary-treasurer

of the Natural Gasoline Association of America, who made the trip from Tulsa, Okla., to represent his association at the California gathering. After these introductions the gavel was turned over to LeRoy Dawson, who performed the toastmaster's functions to everyone's satisfaction. (His explanation of why a wooden leg cannot be classed as a fire hazard was particularly appreciated.)

Unofficial opinion classed the program of professional entertainment, which was made possible by generous contributions of associate members and equipment dealers, as the best the Biltmore has ever seen, and no one who was there would deny it. G. H. Unkefer was chairman of the entertainment committee which put it over.

Smoke Abatement Work *on in* Salt Lake City

SALT LAKE CITY, Utah, has under way a permanent smoke abatement campaign, with $7,000 appropriated by the city to finance the work for the closing months of 1927. Those engaged in the campaign hope for an appropriation of $21,000 for 1928.

Twenty members representing various industries of the city comprise the smoke abatement committee, all of them being members of either the chamber of commerce or the commercial club of Salt Lake City. The Utah Gas and Coke Company is represented by A. W. Schryber, salesmanager. Other industries concerned in the committee work are the local power company, coal producers, the Church (L. D. S.), the railroads, banks, architects and builders. The city commissioners are also represented.

The committee plans a comprehensive program to minimize the smoke evil in Salt Lake City, in which the railroad shops, burning coal, are the principal offenders. Gas company advertising of gas and coke, smokeless fuels, will be tied into the campaign.

KEEFE IN ST. LOUIS

Charles Keefe, manager of the American Seamless Tube Corporation's pipe line department, returned the latter part of November from a two weeks business trip that called him to St. Louis, Mo.

E. C. DEAL PRESIDENT OF PEOPLES LT. & POWER

E. C. Deal, who early this year became vice-president and general manager of the People's Light & Power Corporation, has been made president of that company and of the 21 individual subsidiaries operated by it. Mr. Deal was formerly with the Federal Light and Traction Company, owners of several western gas properties, in Tucson, Ariz., Albuquerque, N. M., and La Junta, Colo. He spent several months in Tucson last year, at the time the Tucson Gas, Electric Light & Power Company's franchise was renewed.

PRAIRIE BUILDING NEAR DONE

Prairie Oil and Gas Company has announced that the addition to its general office building in Independence, Kansas, will be complete about February 10, 1928. The enlarged structure will provide quarters for the general offices of the Producers and Refiners Corporation, which are being moved to Independence from Denver. Prairie Pipe Line Company will also be located in the Independence central building, as it is at present.

Natural Gas *in* Alberta, Canada

(Continued from Page 41)

view the company supplying the cities of Calgary and Lethbridge with gas maintains a geological department.

During the season of 1926 from May to the end of September, Mr. S. E. Slipper, (geologist, Canadian Western Natural Gas, Light, Heat and Power Company, Limited,) conducted an extensive diamond drill exploration survey in Southern Alberta. This is the first occasion in which the diamond drill has been used in Canada for the purpose of locating structures which might be suitable for the production of gas or oil.

As a result of this work, Mr. Slipper was successful in locating the main axis of the Sweetgrass Arch in the southern part of Alberta. As a direct result of using the core drill this structure was found to be in a location different to that in which all previous geological reports had indicated it would be found.

A well has been commenced on this structure west of Warner. All necessary arrangements have been made for a deep test, the hole being started with 20-inch casing. When the hole was only 385 feet deep a heavy flow of gas was struck estimated at 700,000 cubic feet per day. This is a most unusual occurrence, as in no place in the Province of Alberta has such a large flow of gas been obtained at such a shallow depth.

WASTE AND STORAGE OF NATURAL GAS

Unfortunately owing to the peculiar circumstances attendant with Turner Valley development and production, a considerable amount of gas during the summer months goes to waste. Although all the industries at present established in Calgary and Lethbridge use natural gas the total daily demand does not exceed during the summer months from five to eight million cubic feet, and as about thirty million cubic feet per day is at present being produced in Turner Valley, it will be realized that in order to extract the gasoline from this gas that about 15 million cubic feet (after allowing for the gas which is used in the field) is being wasted.

Proposals are now under consideration with the view to eliminating this waste, and it is hoped that this may be accomplished by recharging the upper gas sands of Turner Valley or transporting the gas through the transmission line of the Canadian Western Natural Gas, Light, Heat and Power Company, and recharging the gas sand at Bow Island. This latter proposal would necessitate the installation of compressors, as the pressure required to transport the gas such a long distance, i. e., 200 miles, would in order to overcome the present field pressure, be too great for the pipe line.

SCRUBBING TURNER VALLEY GAS

In consequence of the gas at Turner Valley containing from 300 to 700 grains of sulphur per 100 cubic feet of gas it has been necessary before this gas can be used for domestic purposes that it should be scrubbed. For this purpose the Royalite Company from whom the Calgary gas company purchases its gas, has established a gas scrubbing plant and with the enlargement which has been made this summer will have a capacity of 28 million cubic feet per day.

The natural gas enters the absorbers at the bottom and rises through a soda ash solution which is pumped into and sprayed from the top. The tanks are filled with wooden trays laid tier on tier with openings through which the gas forces its way. These trays saturated with the solution present to the gas an enormous contact surface. The hydrogen sulphide content of the gas is absorbed by the soda ash solution, and the purified gas flows on into the pipe line. As a result of this process the sulphur content is reduced to approximately 5 to 15 grains per 100 cubic feet, which makes it suitable for domestic use.

The gas taken from the Bow Island and Foremost field, which in addition to Turner Valley are used for supplying Calgary and Lethbridge with gas, is practically odorless, and the gas taken from the Viking field to supply the City of Edmonton is also odorless.

The following is an analysis of the gas taken from the Foremost, Turner Valley and Viking fields:

	Turner Valley	*Foremost*	*Viking*
Methane C H-4	69.6%	76.7%	92.5%
Ethane C-2, H-6	26.66	.....	3.5
Carbon dioxide C O-2	1.79	.....	.....
Oxygen O	.45	2.9	0.1
Nitrogen N	1.49	20.4	3.4
Helium H	.0093	.....	.006
Sulphuretted Hydrogen H 2 S	.640 grs. per 100 cu. ft.		.....
Specific gravity	.713	.....	.64

When a gas field has been established wells are drilled on the structure approximately one mile apart in order to maintain an open flow at least equal to four times the daily demand of the consumers. For instance, the open flow of all the 14 wells at Viking, approximately 69,000,000 cubic feet, is just over four times the peak daily demand for gas in the City of Edmonton and adjoining towns during the winter of 1926-7, namely 17,000,000 cubic feet.

UNUSUAL DISTRIBUTION PROBLEMS

The wells in the field are lined up with field lines and are connected to a regulating station at a convenient location in the field where the pressure of the gas is regulated according to the demands being made by the consumers. This, of course, varies where there are considerable variations in temperature as there often are in Calgary during the winter months due to chinook winds. The temperature sometimes will vary in a few hours from 30 degrees below zero to 60 degrees above. In consequence furnaces are shut off and the demand for gas which at one hour may have been at the rate of 25 million cubic feet per day may in a few hours be reduced to 6 to 10. Such a variation naturally demands the greatest vigilance on the part of the operators, otherwise the pressure in the mains would build up to such an extent that they would soon be blown to pieces. A common operating condition in respect to the City of Calgary during the winter months when the temperature is approximately 20 degrees below zero, is to have a pressure at Foremost field of 180 pounds which with the loss due to friction in the pipe would be reduced to 65-100 pounds at Calgary, a distance of 220 miles.

In the case of the City of Edmonton the pressure of gas at the regulating station at the field distant about 80 miles would be about 200 pounds and this would be reduced to approximately 100 pounds at the regulating station at the city limits. Here again the pressure is reduced before the gas is passed into the intermediate pressure loop line within the city and from which the distribution mains radiate. The pressure usually maintained in this intermediate line is 36 pounds to the square inch.

The distribution mains are laid in zones from different points in the transmission line and the pressure in each zone is reduced by a main regulating station to approximately 3 ounces. The above pressures of course vary to meet the changing conditions of load, etc.

HEAT VALUE OF CALGARY GAS

The calorific value of the natural gas burned in Calgary is 1164 B.t.u. per cubic foot measured at O° C and 760 mm. pressure=974 B.t.u. per cubic foot measured at 60° F. and 13 lbs. pressure.

GAS RATES IN CALGARY

The rates charged for natural gas in the City of Calgary are as follows:

FIRST	150M cu. ft. per month	38c Net	42c Gross
NEXT	150M cu. ft. per month	35c Net	39c Gross
NEXT	200M cu. ft. per month	30c Net	33c Gross
NEXT	500M cu. ft. per month	25c Net	28c Gross
NEXT	1,000M cu. ft. per month	20c Net	22c Gross
ALL OVER	5,000 cu. ft. per month	15c Net	17c Gross

Natural gas is now used almost exclusively by householders for heating their homes; the cost at the above rates is cheaper than any other fuel and of course the cleanliness and convenience is infinitely greater. The advantage of natural gas under these circumstances, and in a country where winters are somewhat long, and at intervals very cold, can readily be appreciated. With thermostatic control it is seldom necessary for a householder to look at his furnace. Natural gas, of course, is also used almost exclusively for heating water and cooking.

At the above rates all industries are using natural gas for manufacturing purposes and are effecting a saving over any other fuel.

FUTURE SUPPLY

During the last few years there has been considerable activity in Alberta in drilling for oil, and although up to the present the only commercial oil field which has been established is that of Turner Valley, the drilling which has covered a considerable area has invariably established that there are many and extensive gas areas which can be developed as soon as those which have been established show signs of exhaustion.

The use of gas in the Province of Alberta is controlled by the Board of Public Utility Commissioners and its control is under the supervision of the Dominion Government. In Edmonton natural gas is not used in any large wholesale way for industrial purposes as the policy of conserving the gas for domestic purposes is adopted by the Board, but in the southern part of the Province, due to the conditions prevailing in Turner Valley, where gasoline is extracted from the gas, the latter must be used for every possible purpose in order to eliminate waste of a valuable product.

WEIGH SOOT FALL

Tangible evidence as to the magnitude of the smoke problem has been gathered by weighing the annual fall of soot in several large cities. In the dirtiest of ten centers observed recently, it was found that 794 tons of soot and dust fell per square mile for the year, while in the cleanest community the deposit was 101 tons per square mile.

UTILITIES SET DATES FOR ANNUAL STATE CONVENTION

Announcement has been made from the offices of the Oklahoma Utilities Association that the tenth annual state convention of that organization will be held at Tulsa, March 13, 14 and 15 next. Registration at the 1927 convention held in Oklahoma City was about 800, and this high mark is expected to be passed in 1928.

Gas Advertising *from the* Merchandising Standpoint

(Continued from Page 27)

words, we are really doing more for the American family by recommending that it have a good gas range to cook on than a good automobile to ride in.

From an abstract view of purely institutional gas advertising, I can think of nothing in which the public is naturally less interested. There seems to me to be no use trying to make ourselves believe that we are getting anywhere when we run ads in the newspaper showing a picture of a three million cubic feet holder and four paragraphs about how gas is made, or the amount of coal it takes per year to make it, or the number of times around the world our low pressure mains would extend. Who cares how gas is made except our engineers. What definite interest has that to the people you rode home on the street car with last night, or the people in the movie theatre you attended after dinner. And that is exactly the public to whom our advertising should be directed.

Institutional advertising has its place and its distinct value—needless to say, it has done more than any one thing to build up public confidence in our institutions—but all these facts about our capacities and our monthly sendouts must be a terrible bore to the public.

MERCHANDISE ADS HAVE APPEAL

There is, however, in my opinion, a channel of human interest that does, and always will, bring response. It is advertising aimed at the public, rather than at the utility executive who likes to see the size of his properties and the alleged stability of them projected in pictures and type. It is advertising which tells people something they want to know, rather than what we want them to know. Merchandise advertising finds this channel more negotiable perhaps than does the "good-will type."

Every day there is a new generation of buyers. Every time the clock ticks some home feels the need for some commodity. A million and one factors influence the progress of these wants—the weather, the seasons, the income, the health, the births, the deaths, even the dog. Today the young couple is married, tomorrow they have their first small home, the next day their first small baby, and by the end of the week the baby is married and the cycle starts over again. And where do we think we are going to break into that chain of human events with our so-called "interesting facts about the gas business" or our "chats with the gas man" As the keeper of the zoo answered when asked whether the rhinoceros was a male or a female, "Who'd care, but another rhinoceros?"

But we *can* break into that chain and we can sell goods, too, if the subject matter of our advertising material is tuned in with the things they want to know—the things that are in their minds this week, and completely out perhaps next week. The simplest sort of an illustration makes the point more clear. We have lately been working out some gas range advertising for the fall selling in the suburban territory we serve just outside Chicago. Not that there is anything new in it, but how much more effective and how much more interesting our copy will be because it carries a headline about the fall canning season, about the fruits that will be most plentiful for preserving this year and with the main feature of the copy a new canning recipe, suggesting an easier method of carrying on this important household job, and mentioning, of course, the fact that a good gas range equipped with the latest cooking devices reduces the process to a half-day job, in contrast to old-fashioned methods when canning was a full week event. As I say, there is no news in this—no doubt we will all use copy of this nature during the coming season, but multiply that idea by the number of seasonal events during the year in which the people who use our appliances are vitally interested, and I believe we are a long way from the goal we might reach.

A. G. A. ADVERTISING SERVICE

The very excellent monthly material published by the A. G. A. and made available to member companies has made excellent use of this same thought through the seasonal suggestions made from time to time. Limited of course by the necessary generalities and by the further almost fatal necessity of making the ads apply wherever they are used, this copy and mat service has gone a long way toward following what I consider one of the most essential rules of all advertising—that of timeliness. No company can find better basic guidance than this series of ads. Although I have no definite information to prove it, I should imagine that many organizations with somewhat limited advertising resources would use it altogether for newspaper copy. Unless they can prepare material of their own to do the same job a great deal better, they need not worry about their fundamentals as long as they stick to this A. G. A. monthly service.

Why doesn't a gas range make a fine Christmas present—or a gift on Mother's Day? Why isn't it more appropriate to advertise gas for house heating during the particular months that people are thinking about next winter's coal supply? Another illustrations from my own experience shows again the value of timeliness—of hitting in the vulnerable spot—at the time it is vulnerable. A few weeks ago a certain town in Illinois ran out of ice during an exceedingly hot spell. After three days of the heat the ice companies were sold out and there was no ice to be had—foods were beginning to spoil, baby's milk began to sour—the next day we ran a half-page ad in the local newspapers on electric refrigerators, followed that with a somewhat smaller ad, and that week we sold as many refrigerators in that town as we had sold all year, up to that time. The prices were the same, the selling arrangements were the same; there is but one reason—people were interested in refrigeration.

Call these details, if you like, that need only occasional consideration as part of a set advertising program, but my answer is that they are usually *not* given that consideration and any up-to-date merchandiser or advertising producer will tell you that they are the very essence of legitimate modern salesmanship.

We are prone to think that there is a limited market for some of the appliances, that only so many people will buy them each year, and that the buying habits of the public are so regulated that we can sell certain merchandise in volume at only certain months of the year. While much of this is true, it is largely true because of a merchandising laziness that fails to correlate the passing of events. Water heaters, for instance, should have no season. Neither should

ranges if the markets are analyzed and people are actually made to know that gas ranges are in some way connected with what they are doing today, tomorrow or the next day.

BETTER AIMING OF ADVERTISING

And the aiming of advertising is deserving of attention perhaps more in the use of direct-by-mail, house-to-house canvassing, and so forth, than in newspapers. Selling through the mail depends entirely upon the timeliness or appropriateness of your message.

It is a question whether it is more futile to send out a folder or a booklet on gas for house heating in the middle of the winter when it is impossible to make a change in the heating arrangements, or in the middle of the summer when heat or heating is the last thing people want on their minds. Yet many of our campaigns use these months to the exclusion of others, simply because we want to fill in the gaps in our sales charts, or because some other advertiser makes the same mistake.

Along the same line, how futile it is to mail advertising matter on water heaters, refrigerators, or perhaps gas ranges in a town or district of thirty to sixty per cent apartment dwellers where all of those appliances are furnished to the renter. And what an impression such looseness in advertising practice makes on the recipient of your beautifully colored broadside, especially if he happens to be a stockholder who likes to wonder what the company does with its money.

This subject of market analysis brings into the discussion a number of elements worthy of consideration by the gas company advertiser We have in our hands as perfect a mailing list of our prospects as can be had. Our meter records and our addressograph billing facilities open to us a list of sales potentialities that would be priceless to many merchandisers of everyday commodities for its accuracy and up-to-dateness. Yet how many gas companies or gas and electric companies take the trouble to classify their customers for advertising purposes according to the nature of the service rendered. How many mail campaigns on water heaters for the home are sent to the homes all right, but also to the butcher shops and meat markets, schools, garages, hotels and restaurants. In the company I represent, serving about a million population, the saving in wasted advertising since a detailed classification, to correct this difficulty was established, has been estimated at upwards of twenty thousand dollars a year, and we are still trying to get the bugs out of our advertising addressing.

If you buy a Buick automobile, or a Packard, you haven't driven the car a month before you begin to receive advertising matter on accessories, tires, or what not, addressed to you as a Buick or a Packard owner. Your immediate attention is gained because the advertiser is talking to you in your own language about something you are interested in, something you own and use every day. We who sell household appliance merchandise have even better opportunity to aim our advertising accurately, yet the buy-and-large selling habit which of necessity identifies our sales of service, seems to have drawn us away from the careful planning of sales and advertising efforts that makes for merchandising results.

SALES TERRITORIES DIFFER

As many of you know, the territory of the Public Service Company covers the 6,000 square miles immediately outside Chicago's city limits. This area contains about as complete a hodge-podge of American humanity as can be found elsewhere in the country. We serve communities in the northern territory that seem to have identical characteristics with other communities in our southern territory. Likewise we serve communities which are side by side, but which seem to have absolutely nothing in common except the fact that they are both in Illinois. Take Oak Park and Cicero, for instance—both western suburbs—both of comparatively large population—yet inhabited by as different classes of people as two different races might be. Oak Park is a high class residential suburb, with many fine homes, churches, schools and the people to go with them. Cicero, a few blocks south, is purely an industrial city, with a large foreign laboring class population—incidently considered the hatchery for most of our justly famous Chicago gun men.

Obviously, on the face of it, we should not expect the same merchandising or advertising to go in both towns—and yet to put your finger on the tangible differences that can be made in advertising appealing to those two communities—to point out exactly what will appeal in one and not the other, has proved to be one of our greatest advertising problems.

And those are but two types of communities—consider also the vast difference in living conditions, in buying habits, in estimates of luxury—between either Oak Park or Cicero and some of our more remote yet equally as important farming communities—away from the direct influence of Chicago markets and Chicago newspaper advertising—"downstate" towns, so to speak, inhabited in the main by retired farmers and their families. The most accurate advertising would differentiate between these types—but how to do it—and exactly what these differences should be is, as I say, one of our toughest problems. Yet it should be done—at least it should be attempted.

TWO COMMUNITIES ANALYZED

In such an attempt to get at the buying habits of the territory served, a rather superficial but enlightening market analysis was made of two communities. The two communities were Oak Park, as being typical of the close-in suburbs of the more metropolitan type, in which our advertising was competing with that of the Chicago loop stores through the Chicago daily papers, and Morris, a town of 4,500, as being a typically "downstate" town, away from the Chicago markets and inhabited by people of somewhat different needs and domestic thinking habits.

The complete conclusions to be drawn from the findings of the study have not been made as yet, but I should like to simply mention some of them to show how we are trying to learn more about the people who are alleged to read the advertising we write. Many of these figures refer to electricity consuming appliances, but the tendencies they show toward the purchase of appliances relate as well to gas.

Among the appliances used in the home we found that 96 per cent of the families were using electric irons, 81 per cent vacuum cleaners, 60 per cent washing machines, 52 per cent toasters, 39 per cent electric fans, 18 per cent waffle irons, 5 per cent refrigerators. That these figures may check with your own ideas along this line is borne out by the fact that the percentages are almost identical in both towns, the nearby suburb and the "downstate" village.

We found that as a general thing the amount expended each year for appliances was greater by families in Oak Park and near Chicago than in Morris, 60 miles downstate—25 per cent of the families in Oak Park spending more than $50 per year, and but 10 per cent in Morris. In the same way the varying percentages of families spending an amount less than $50 per year indicated that in the suburban community the usefulness of labor-saving equipment was more fully realized. Regardless of whether the cause for this difference lies in the fact that Oak Parkers have more money to spend for appliances, or in their proximity to the metropolitan center, or in the very nature of the people themselves, the information is valuable as it stands for the more intelligent aiming of our advertising matter.

In both towns we were able to conclude from the analysis that the housewife herself actually purchased half or all the appliances to be used in her home in 68 per cent of the families, and that the husband buys half or all of the appliances in but 25 per cent of the families. In relation to its bearing upon the very important advertising detail of writing copy for men or for women, this information gives us some knowledge; if not completely accurate, sufficient to guide us in the general tendency to be employed.

I think a great deal can be done through careful preparation of mailed material to back up the work of your industrial gas salesmen. We have a monthly mailing campaign of photographs of unusual installations with a brief description of the job enclosed, with no sales talk whatever, no argumentative copy on the advantages—simply photographs of how other people are using our gas industrially. We feel that during the two years this campaign has been carried on, the new jobs we have sold, and the additional load added to existing customers—all of which have been definitely checked back to these photographs, has more than repaid us for the cost. But that is but one thing out of a hundred possibilities.

PINE ISLAND BOOSTER PLANT NEARING COMPLETION

The Arkansas Natural Gas Company has practically completed a booster station at Pine Island, Louisiana, and seven miles of 10-inch line from the field to Rogers station at Lewis, on the company's main line north into Arkansas. This station, on completion, will handle around 15,000,000 feet daily from the field. It has seven 110-h.p. gas engines driving Ingersoll-Rand compressors.

SENDOUT JUMPS 300 PER CENT

A 300 per cent increase in gas sendout has been recorded on the lines of the Baton Rouge Electric Company since natural gas was turned into its mains in Baton Rouge, La., about June 1.

MAGNOLIA MOVES AGAINST TRANSMISSION RULING

The Magnolia Gas Company has taken action against the law prohibiting piping of gas outside of Oklahoma, and has applied to the State Supreme Court for a writ of mandamus to compel Secretary of State Leeper to issue a charter. Eight gas companies are reported to operate lines out of the state now, but legal heads of the Magnolia stated the company would not risk confiscation of equipment, which would cost roundly $1,000,000, required to construct a contemplated line for moving gas over state borders.

With *the* Metermen

Seventh Short Course *of* Mid-West Group Due

PROGRAM plans for the Seventh Annual Meter Short Course, being held at Ames, Iowa, under the auspices of the Mid-West Gas Association and the Iowa State College, are nearly complete according to Robert L. Klar, chairman of the Short Course committee. Dates for the coming meter school are December 6 to 9, inclusive.

Carrying out a policy inaugurated several years ago, there will be a number of features introduced into the Course designed to be of value to production and distribution men, and the Course is divided into these three sections, meter, production, and distribution.

Meter repair work will be under the supervision of Geo. A. Lane of Chicago, who has a corps of well-trained assistants and will himself deliver three lectures on tin case meters. Mr. Werthman of Davenport will direct the work on iron case meters, and also will have a number of assistants.

In the distribution group there will be eight papers and discussions. The titles of these eight papers are as follows: "Installation and Maintenance of Services," "The Use of Power Machinery in Distribution Work," "High Pressure and Low Pressure Distribution Systems Compared," "The Theory of Combustion," "Technicalities of Water Heating," "Technicalities of House-Heating," "Leakage Survey," and "The Cost of Meter Repairing."

In the production group are scheduled five papers and discussions: "Checkering of Carburetters and Superheaters," "Oil Efficiencies," "Tar Emulsions," "Utilization of Steam," and "Developments of Soft Coal During the Past Year as Generator Fuel." In addition to the distribution and production papers enumerated, there will be a paper by H. E. Bates, Peoples Gas, Light and Coke Company of Chicago, on a topic of general interest to the gas industry at large.

In addition to the day-time activities of the Course, a smoker will be held on one evening and a banquet on another evening.

The Mid-West men introduced the Meter Short Course idea to the gas industry in their first school, seven years ago. Their first course was devoted entirely to meter work, but in the light of subsequent needs the distribution work and production offerings have been added to the program.

Executives of the principal companies in the territory comprising the Mid-West Gas Association—Iowa, Nebraska, Minnesota, North and South Dakota—have aided in stimulating interest in the coming Short Course, which is expected to draw a large attendance from the states named.

SOUTHERN GAS CO. WORKING ON 55-MILE LINE

Work on a 55-mile, eight-inch gas line from San Antonio to New Braunfels and Seguin is in progress by the Southern Gas Company. The total cost of the line is estimated at roughly $750,000. The 55 miles is main line, and does not include distributing systems for the two cities.

Hi-Jinks Draws 200

R. N. Brown, secretary of the Southern California Meter Association, called the turn when he announced that "Monkey-Biznis" was to be the order of the day at the Association's Hi-Jinks, held at the Oaks Tavern, Los Angeles, on the evening of November 25. Over 200 sat down to one of the Tavern's notable steak dinners at seven o'clock.

President T. K. M. Smith was on hand, fresh from a vacation in Honolulu, T. H., to wield the gavel.

The capable entertainment committee of the association, made up of W. N. Flesher, chairman, G. R. Hoffman, C W. Brockman, and T. G. McAlister, emptied their whole bag full of tricks on this occasion for the benefit of association members and their guests.

December Program

With the Hi-Jinks passed into history the Southern California meter men are planning their next monthly business session, scheduled for the Breakers Hotel, Long Beach, for 6:30 p.m., December 29.

Two papers are being tentatively arranged for this meeting, one by E. G. Hoggard of the General Petroleum Corporation, on "Specific Gravities of Wet Gases", and the other by M. O. Jensen of the Jensen Instrument Company, this feature to take the form of a description of the new Foxboro meter.

NEW INDUSTRIAL RATE SET IN KANSAS CITY

Kansas City Gas Company has originated a new industrial gas rate, based on a three-year contract which will be available January 1, 1928, providing the following terms:

Seventy-five cents for the first 400 cu. ft. or less per month.

Nine cents per 100 cu. ft. for the next 11,600 cu. ft. per month.

Eight and one-half cents per 100 cu. ft. for the next 48,000 cu. ft. per month.

Eight cents per 100 cu. ft. for the next 250,000 cu. ft. per month.

Six and one-half cents per 100 cu. ft. for the next 300,000 cu. ft. per month.

Two cents per 100 cu. ft. for the next 24,400,000 cu. ft. per month.

One and sixty-five hundredths cents per 100 cu. ft. for all over 25,000,000 cu. ft. per month.

This marks the expected completion of the Empire Company's mammoth line to Kansas City from the Texas Panhandle region, which, according to T. J. Strickler, vice-president and general manager of the Kansas City Gas Company, will double that community's gas supply. The city has a large industrial expansion program under way, which will be measurably hastened by the introduction of the new gas supply and the favorable rates thus made possible.

GAS COMPANY TRUCK RUNS ON COMPANY PRODUCT

The Union Gas and Electric Company of Cincinnati, Ohio, has substituted the use of natural gas for gasoline in the operation of a twenty-four horsepower truck which is used in its service. A steel tank and an air mixer were used to replace the gasoline tank and the carburetor, but aside from these there were no changes. Approximately ten cubic feet of gas, at low pressure, operates the truck one mile, at a cost of three-fourths of a cent, figuring the cost of the gas at seventy-five cents per thousand cubic feet. The gasoline cost per mile with gasoline at twenty cents a gallon, is two cents.

SAN ANTONIO INDUSTRIES TURNING TO GAS

Gas is steadily taking its place in San Antonio, Texas, as an industrial fuel, as a result of the community's increased supply of natural gas and its rapid growth and expansion along industrial lines.

San Antonio Public Service Company, has contracted to supply gas to the Missouri-Pacific Shops in South San Antonio for boilers, forging furnaces and other installations requiring fuel. This customer will call for approximately five and a half million cubic feet of gas per month.

Another large customer secured by the company is the Texas Steam Laundry, now using some three million cubic feet of gas monthly.

The excellent work of the commercial department of this utility is seen in the following figures:

Revenue for industrial gas in 1925	$ 94,000.00
Revenue for industrial gas in 1926	240,000.00
Revenue fo industrial gas in 1927, estimated	500,000.00

WOOD ALCOHOL FROM NATURAL GAS MAY BE FUTURE RESULT

Another by-product may be developed from natural gas. Dr. E. P. Schoch, professor of chemistry of the University of Texas, believes that within a year chemists will have perfected a process of obtaining wood alcohol from natural gas. If this is obtained, Dr. Schoch predicts that the discovery will revolutionize industry by producing a cheaper fuel. Natural gas is already the source of many by-products, including gasoline, carbon black, helium, methyl, ethyl, chloride, choloroform, formaldehyde and formic acid.

PROBLEM FIRE DRILLS

The natural gasoline department of Union Oil Company of California is now putting over a program of problem fire drills, to instruct plant men in the handling of specific emergencies.

NATURAL GASOLINE NOT PATENTABLE

That natural gasoline is not patentable as a new product when it merely differs from other gasoline in containing more butane is the recent decision of the U. S. district court of the southern district of Texas.

Organization Changes *in* So. Calif. Gas Co.

LATE in November a transaction was consummated by three prominent Western utility men, W. G Kerckhoff, A. C. Balch, and Ben R. Meyer, former owners of the Southern California Gas Company, whereby a minority interest in that utility was purchased by the Chase National Bank interests of New York. These interests are represented by the Chase Securities Corporation and Stone & Webster, widely known in the public utility field, Hunter, Dulin & Company investment bankers of Los Angeles, and Pynchon & Company of New York.

Mr. Kerckhoff is resigning as president of the Southern California Gas Company, his successor being Alexander B. Macbeth, formerly executive vice-president of the company. Mr. Kerckhoff, Mr. Balch and Mr. Meyer become vice-presidents.

No change in company policy is contemplated, the control of the directorate residing in Southern California interests. Enlargement of the board to admit other Los Angeles business men is being planned. No material change in company personnel is involved in the development.

The Southern California Gas Corporation, a Delaware corporation, has been formed to purchase the stock of the Southern California Gas Company after the latter's consolidation with the Midway Gas Company, Central Counties Gas Company, Hanford Gas and Power Company, River Bend Gas and Water Company and Valley Natural Gas Company. Mr Macbeth has been elected president of the Southern California Gas Corporation. Its preferred stock will soon be offered by a syndicate of California bankers.

AUSTIN-NEW BRAUNFELS LINE

Plans for a 69-mile gas line from Austin to New Braunfels, Texas, were reported complete in November, the line to move gas to Austin for distribution by the Southern Gas Utilities.

Announcement of the purchase of the Oklahoma Natural by the American Natural Gas Company is of great in erest in South Texas since F. L. Ohrstrom & Company, who figured in the deal, are backing the Austin Gas Company.

FLINT IN SAN FRANCISCO

K. H. Flint, representative of the American Gas Association Laboratory on the Pacific Coast, left Los Angeles the last week in November for a three weeks' stay in San Francisco, where he will work with local gas appliance manufacturers in furtherance of the Laboratory program.

CELEBRATE COMING OF GAS TO MILES CITY

Miles City, Montana, celebrated the introduction of natural gas early in November, the town declaring a general holiday to mark the turning on of service in the Minnesota Northern Power Company's mains. Hope Engineering Company laid the 76-mile line bringing natural gas to Miles City.

GEISLER LEAVES BATON ROUGE

H. P. Geisler, Jr., gas superintendent and sales manager of the Baton Rouge Electric Company, Baton Rouge, La., has taken a position in the appraisal department of Stone & Webster, Inc., with headquarters in Boston. Mr. Geisler at one time was gas superintendent for the Puget Sound Power & Light Company.

House heating window at P. G. and E's. Sutter Street offices in San Francisco

San Francisco Dealers Stress Quality Heating

THE Blue Star Furnace and the essentials of a quality heating job were recently featured by the appliance dealers of San Francisco, through the Gas Appliance Society, and with the cooperation of the P. G. and E.

During the two weeks from October 8th to 22nd one of the gas company's windows at 447 Sutter street was trimmed with a gas furnace, a suggestion of a home, and windowcards bearing texts on the advantages of gas heating. Of particular interest was one card, labeled "The Essentials of a Quality Heating Job." To achieve a perfect score, so the tabulation said, the following percentages should be considered:

1. Adequate size of furnace, centrally located.....20%
2. Correct pipe and register size.....20%
3. Proper air cell insulation.....20%
4. Cold air return.....20%
5. Chimney or flue of proper draft..20%

A number of the dealers and manufacturers among whom were the American Gas Products Company and the C. B. Babcock Company, co-operated with the gas company and the Gas Appliance Society in using newspaper display space during the period.

First Regional Sales Conference Held *in* South

SPONSORED jointly by the commercial sections of the American Gas Association and the Southern Gas Association, the first Southern Regional Sales Conference was held at the Biltmore Hotel, Atlanta, Georgia, marking another step in the expansion of the regional sales conference program.

More than 75 men attended the southern sessions, which were arranged by a committee consisting of M. L. Kane, chairman; C. A. Collier, vice-chairman, and George J. Kollock, secretary—the committee co-operating with J. W. West, Jr., secretary of the A. G. A. commercial section.

W. E. Mitchell, vice-president of the Georgia Power Company, delivered the address of welcome, pointing out the tremendous unsold field for gas in industry and the home which yet remains for exploitation.

Papers on the conference program included those by G. M. Karshner, Consolidated Gas Company of New York, who emphasized the importance of increasing sales per consumer; R. H. Morehead, Jr., Georgia Power Company, Atlanta, on the value of campaigning; Miss Cephalie Lewis, Augusta, Ga., on home service; E. P. Bailey, Bryant Heater Company, on "Marketing Gas for House Heating;" N. T. Sellman, Consolidated Gas Company of New York, on "What's Ahead in Refrigeration by Gas?" (This paper appears on another page of this issue); C. I. Baker, Hoffman Heater Company, on "Increasing Water Heater Sales;" A. E. Higgins, A. G. A. field representative, on the Blue Star Plan.

An inspection trip to restaurants, hotels and industrial plants using gas was made on the afternoon of November 15.

WANTS STOCK ISSUE

Coast Counties Gas and Electric Company, San Francisco, has applied to the Railroad Commission of California for permission to issue and sell 4,000 shares of its first preferred capital stock at not less than 97 per cent of par value, $100 per share, and to use the proceeds to reimburse its treasury and to finance additions and betterments.

GAIN TWO WEEKS ON LINE

Completion of the Empire Companies line from the Texas Panhandle to Kansas City is expected about December 15, two weeks ahead of schedule. Kansas City's gas supply will be doubled by the new transmission line.

The Selling *of* Gas Refrigerators

(Continued from Page 30)

Special assembled refrigerating equipment for ice-cream freezers, soda fountains and drinking water.

Commercial units in ½, 1 and 2-ton sizes.

I believe we should appreciate that with this variety of equipment we have a selling problem which can properly be compared with gas-fired house heating boilers. Most of us have already come to realize that the heating business requires special salesmen as well as trained shop men for installation and service work. The brief experience that I have already had with gas-fired refrigerators, without consideration to the future possibilities, convinces me that refrigeration to be successfully sold necessitates the development of a special organization for selling and installation work.

There is still much to be learned about this relatively new subject of refrigeration.

The manufacturers of gas-fired refrigerators need the help of the gas men who are interested in refrigerator sales and installation. The gas man's experience must be used in a constructive way to guide the manufacturer in making further improvements, and adding the necessary equipment to meet all requirements. Furthermore, refrigerating equipment is so new that a certain amount of testing should be conducted until it is firmly established that the manufacturer's product is absolutely reliable in material and workmanship. Consequently, it is for the present advisable to test every unit before it is installed. A record should be kept of every installation, and any subsequent service calls added to the record. The service man should make an accurate report of every visit as to conditions. The Consolidated Gas Company, of New York, has followed this procedure, and furthermore, the manufacturer has been continually kept informed of the slightest difficulty experienced. This is done in a spirit of helpfulness rather than in criticism. The cost of labor and material is part of the record kept for each installation, so that we can plan accurately for any changes in future sales policy.

SUMMARY OF DEVELOPMENT

Before gas fired refrigerators can become a nationwide success, the people of the gas industry must be convinced that the absorption method of refrigeration is basically correct and that it is the logical method for future development. A brief summary of the progress made in the absorption type of refrigerator should help convince some of the doubters. Many of you may recall that the electric wizard Steinmetz prophesied a number of years ago that the absorption method would provide domestic refrigeration of the future, and that gas would be the logical source of heat.

The absorption type of refrigerating unit operates by heat, evaporating under pressure a suitable liquid known as the refrigerant, which is then condensed through cooling coils, this condensed refrigerant being subject to the same pressure as that created by the heat during evaporation. By allowing the condensed refrigerant under pressure to escape through a small opening into a vessel subjected to a lower pressure, the absorption of heat from the surroundings takes place; thus we produce cooling or refrigerating effect. Briefly, this describes the absorption method.

The heat used for evaporating the refrigerant may be supplied by the use of any fuel, electricity or steam. Gas as the source of heat for this purpose was tried several years ago, but the majority of the early successful absorption units used steam as the source of heat.

The early development of the gas heated absorption type refrigerator was in commercial sizes of ½ ton capacity or larger. These units were in most cases hand operated, bulky in size and practically void of proper control and safety devices. Later on attempts were made to build domestic sizes. A few manufacturers tried to build the unit with the refrigerator box, but most of the units were designed for installation separate from the box. The domestic units were more or less automatic, but in the main they were bulky, expensive and lacking of sales appeal. Practically all of this development was based on one common principle; that is, they were of the intermittent type and used aqua-ammonia as the refrigerant. By careful and unique design, a few makes based on the above principle have reached a point where they are salable and are well suited for certain requirements.

This description of progress brings us to about 1925. During that year several new developments became generally known to most of us, particularly those pertaining to units suitable for domestic refrigeration. One development known as the Electrolux-Servel refrigerator made possible continuous refrigeration in a compact unit which is void of any valves or moving parts. Another development introduced by the National Refrigerating Company makes use of a solid absorbent in place of water. A third development is a unit which secures a continuous refrigerating effect by the use of only one moving mechanism which is in purpose similar to a steam trap of the lift type. This latter machine is known as the Schurtz refrigerator and is only available in commercial sizes. Other new departures are still under process of development—for example, Silica-Gel may be successfully applied to a heat operated unit. Mercury vapor is being experimented with as a means of producing a low pressure heat operating unit; also numerous other refrigerants are being investigated.

GAS SHOWN TO BE MODERN FUEL

During the past few years progress has been exceedingly rapid, and the gas industry is now in possession of refrigerating units which are in every respect improvements over those that have been developed on the compression principle. Every gas man has heard a countless number of people express the opinion that electricity is the heating source of the future, and that it will replace gas for all purposes. Frankly, has any development in the gas industry in recent years so clearly disproved this fallacy as the gas-fired refrigerator? The extended use of electric refrigeration would make it seem that the gas man's efforts would be in vain unless the gas-fired refrigerator is superior. The fact is that people are readily accepting gas-fired refrigeration as an improvement over the compression type, and are now beginning to wonder what will be the next great advance in gas utilization. This change in public opinion that gas is after all the modern fuel, and that its uses are rapidly increasing, is without doubt a great stimulus for awakening public interest in the various purposes for which gas can be used.

Automatic house heating and water heating equipment, laundry appliances, incinerators, and all other purposes for which gas can be used in the home as well as in industry, will now sell more readily, for we have proved to the layman more clearly than ever before that "if it is done with heat it can be done better with gas."

My contact with people outside of the industry, with whom I have had an opportunity to talk gas refrigeration, has convinced me that the gas industry now possesses that which has been lacking—*Romance.* Until recently most domestic gas customers only came in contact with our product through the use of a prosaic cooking appliance, and consequently they were not sufficiently impressed with the service that gas can give to invest in an automatic water heater, boiler or furnace. The gas refrigerator plays on the customer's imagination, and awakens a wonder and respect for the manner in which gas can be harnessed to accomplish useful purposes. Wonder leads to interest and interest leads to sales.

L. A. Board *of* Bldg. *and* Safety Approves Lab.

ON November 14 the ordinance enacted by the city council of Los Angeles, requiring all manufacturers of gas-fired warm air furnaces to have their furnaces tested for construction and thermal efficiency in an adequately equipped laboratory became effective.

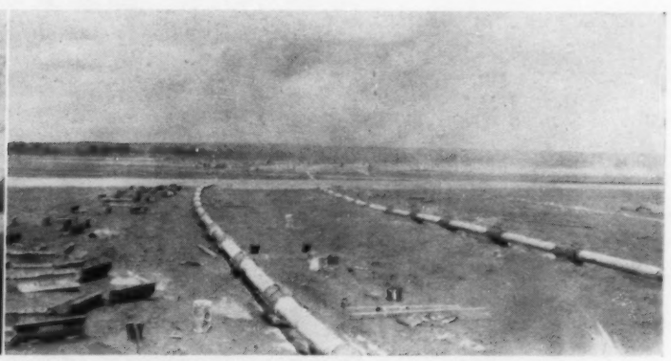
Following the application of the American Gas Association Testing Laboratory to the Los Angeles city board of building and safety commissioners for recognition as a laboratory capable of conducting such tests, O. E. Phillips, heating and ventilating engineer for the city of Los Angeles, made a trip to Cleveland to inspect the laboratory at first hand.

Returning to Los Angeles in November from this inspection, Mr. Phillips reported himself highly pleased with the laboratory and its personnel, his favorable opinion being conceived in the light of (to quote Mr. Phillips) " . . . the protection that will be given to the manufacturers of gas-fired warm air furnaces, by virtue of the fact that this laboratory is equipped with machines that are accurate to two parts in one hundred thousand, and that the technical staff supervising these tests are all graduate engineers in their respective duties in the process of testing the furnace . . . it is my opinion that the manufacturer can rest assured that . . . the results of the test are as accurate as it is humanly possible to obtain."

As concrete results of Mr. Phillips' inspection, the approval of furnaces by the A. G. A. Laboratory has received the recognition of the Los Angeles Board of Building and Safety Commissioners, in accordance with the provisions of the ordinance. Also, any other laboratory which might make application to be recognized by the board will be judged in the light of the high standard of efficiency in equipment and personnel set by the Cleveland laboratory, and will have to be prepared to test not only gas-fired furnaces, but other appliances as well, according to Mr. Phillips.

REFRIGERATION GOES SOUTH

The Panama-Colon Gas Company has started to convert its consumers to the advantages of gas refrigeration, an Electrolux-Servel machine being on display in the company's offices. True to form, S. Paul Vecker, vice-president and general manager of the far-South utility, is cashing in on a big share of good publicity for the gas company from the new development.



LEFT: *Applying felt coating to section of Empire Companies' Texas-Kansas gas line.* RIGHT: *Section of line wrapped and whitewashed, ready for river crossing*

Protecting a $20,000,000 Line *from* Corrosion

IN the interest of protecting a $20,000,000 investment tied up in the 20-inch natural gas pipe line from Pampa, Texas, to Wichita, Kansas, now nearing completion, the Empire Companies, Bartlesville, Oklahoma, are taking due precautions to insure the line against external corrosion.

Extensive tests were conducted in the Empire laboratories prior to laying the line to determine upon pipe coating preparations which would withstand soil action, prove impervious to ground water and provide adequate insulation against electrolysis.

LABORATORY TESTS CONDUCTED

A large number of commercial coatings and paints were tested for relative durability when exposed to conditions similar to those obtaining along the pipe line. Results of these tests indicated that for mild corrosive conditions an economic protective coating could be obtained, consisting of a cold priming coat followed by a hot enamel. Both these, tests indicated, should be coal tar products. The tests further indicated that for highly corrosive conditions, such as river crossings and in the "gyp" country alone the line, the protective coating might well consist of three coats of coal tar pitch, applied hot and in which are embedded two layers of asbestos felt.

The primer and enamel coating is being used on all of the 20-inch pipe with the exception of approximately 11½ miles of line southwest from the Cimarron River. This section of country is rough and contains "gyp" formations to the extent of warranting a higher degree of protection. Consequently, this 11½ miles of 20-inch pipe together with the pipe in the four major river crossings is being protected with the coal tar pitch and asbestos felt wrapper.

The coal tar primers and pitch used on the wrapped portion are being manufactured as a by-product of artificial gas production and are being supplied for this job by the Public Service Company of Colorado, a Doherty organization.

Before the paint is applied, the pipe is being thoroughly cleaned by workers using wire brushes to remove all dirt, rust and mill scale from pipe and welds. It is sometimes necessary to use files in removing the oxidized substances which are formed during the process of field welding.

The priming solution used with the enamel coating is normally a liquid and is applied cold, being spread over the entire outer surface of the pipe with long handle roofing brushes. This primer, while it may have some value as a corrosion preventing agent, is used primarily as a bonding medium between the pipe and the enamel.

The enamel, which is the real corrosion resisting agent of this type of coatings, presents a much more difficult problem of application than does the primer. Under normal conditions, the enamel is a solid and must be heated to around 350 degrees F. before it becomes a free flowing liquid. This heating process is carried on in 100-gallon kerosene-fired kettles from which the molten enamel is drawn into four-gallon pouring buckets. The molten enamel is poured on the top of the pipe and is allowed to spread over the top and sides and run to the bottom, where it is caught in a canvas sling so manipulated as to spread the coating over the under sides of the pipe. In cases where it is necessary that the enameled pipe be exposed to the sun for several days, a coat of whitewash is applied over the enamel in order to prevent sagging.

Touching up the enamel job on part of Empire line

This type of coating requires about 55 gallons of primer and 9¼ tons of enamel per mile of 20-inch line.

The coal tar pitch-asbestos felt or double wrap coating is applied in much the same manner as the enamel coating except that after the primer and first coat of pitch are applied, and while the pitch is still hot, a layer of asbestos felt is placed around the pipe and embedded in the hot pitch. The second coat of pitch is then put on and the second layer of felt placed. This second layer of felt is so placed on the pipe as to stagger joints with the first layer and is wired in place to prevent the felt from pulling away from the pitch. The second layer of felt is then thoroughly covered with the hot pitch and allowed to cool, after which whitewash is applied in order to protect the coating from the sun's heat.

CONTRACTS LET, WORK TO START ON DENVER LINE

Contracts have been let on the gas line from Texas Panhandle reserves to Denver, Colo. The northern section of the project, between Clayton, New Mexico, and Denver, will be laid by William Bros., Inc., of Tulsa, Okla., and Oklahoma Contracting Company has the contract on the southern portion. The northern division is 253 miles long, and the southern 83 miles long. Actual work was expected to begin about December 1, and when the project is under full swing some 2,500 men will be employed on it.

Several pipe deliveries have been made. Work will begin at Devine, nine miles east of Pueblo, and will progress in both directions simultaneously. Denver, Colorado Springs and Pueblo are expected to have gas by the fall of 1928.

NEW 35-MILE LINE BEING BEGUN BY LONE STAR

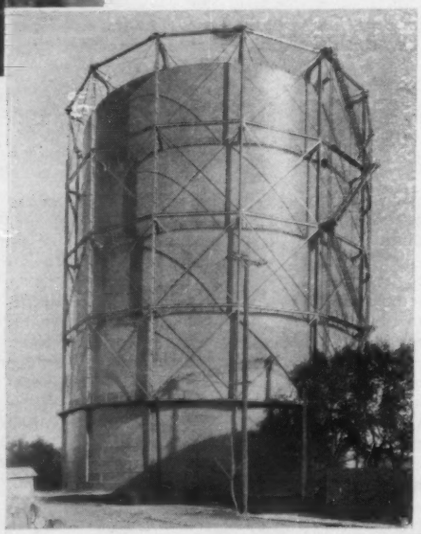
The Lone Star Gas Company of Dallas, Texas, is ready to start construction of 35 miles of new line from a shallow gas field near Valera to Brownwood, Texas, where a franchise was purchased several months ago. The new line is to improve the service to customers.

Lone Star is now completing its extension of its trunk system to Colorado City in Mitchell County of West Texas, using combination 8 and 10-inch welded pipe.

PUBLIC UTILITIES FRANCHISE SUSTAINED IN EL DORADO

A decision handed down by the Union Chancery court in El Dorado, Arkansas, which held that a franchise granted the Public Utilities Company of Arkansas was illegal, was reversed recently by the Supreme court of Arkansas. The lower court held that a franchise granted J. W. Atkins et al in 1921 was exclusive, and the suit came up following the granting last winter by the El Dorado City council of a competitive franchise to the Public Utilities Company.

LEFT: *General view of Stockton, Calif. gas plant of Western States Gas and Electric Company, taken from new 2,000,000 cu. ft holder.* BELOW: *Holder referred to above; view looks toward inlet*



Complete Half Million Dollar Additions *at* Stockton, Calif.

THE Pacific Gas and Electric Company has completed the half million dollar construction program started at Stockton, Calif., several months ago, whereby it is providing additional facilities for the Western States Gas and Electric Company's gas generating and distribution plant.

The gas holder, erected on the north east corner of Commerce and Church Streets, will have a storage capacity of two million cubic feet of gas. This container is 170 feet high and 145 feet in diameter. It will triple the storage capacity of the local plant, which will now be 2,990,000 cubic feet of gas.

P. G. and E. engineers have rushed this job to completion in order to have adequate facilities to insure continuity of service during the coming winter season. An average of 50 men have been employed for the past five months building the container, which cost $315,000, including the site. Generating facilities are being added at the plant consisting of a 12-foot, 2-shell improved oil gas generator. This machine will have a generating capacity of two million cubic feet of gas per day, which is double the present capacity of the plant. This generator, with primary and secondary scrubbers, blowers, oil heaters, operating facilities, piping, etc. calls for an expenditure of $150,710.

With the completion of these added facilities at the local plant, the company will be in a position to supply gas to Lodi and over other long distance transmission lines. The Lodi line is about completed, having given employment to 75 men for the past three months and involved an expenditure of $89,391. This main is 13 miles long and of six-inch welded pipe. In addition to supplying gas service to Lodi, it will also make gas available to property owners along its route between Stockton and Lodi.

Stockton now becomes the manufacturing center for gas which will be available for distribution over a wide area in this section of northern California, as the territory develops.

The Pacific Gas and Electric Company is a pioneer in long distance transmission of artificial gas and now operates nine interconnected systems which are: Marysville to Oroville, Sacramento to Roseville, Woodland, and Davis; Oakland to Pinole on the north, and Hayward on the south; San Francisco to Los Gatos; San Rafael to Sausalito; and Santa Rosa; Vallejo to Napa; Grass Valley to Nevada City; Monterey to Pacific Grove; and Stockton to Lodi.

A further interconnection of gas plants in the Sacramento Valley was announced in November by the P. G. and E. This information comes closely following the completion of a 32-mile eight-inch high pressure gas transmission line extending from Marysville to Oroville.

It is planned to tap the Marysville-Oroville main at the Richvale Y and extend it north to Chico. Work on this 21-mile extension is to begin within a few weeks. Material has been ordered and approximately 100 men will be employed for a period of five months.

The new Chico line will cost approximately $162,188. Major items in the cost are $57,500 for pipe and $96,188 for labor.

The entire main will be wrapped with a special composition to prevent rust and corrosion. There will be 6,600 joints which will be welded and separately wrapped.

RATES DROP IN SALINA

United Power and Light Corporation has applied a voluntary rate reduction in Salina, Kansas, which is expected to save consumers $50,000 a year. Natural gas has recently been introduced by the company from wells 29 miles south of Salina.

BRING GAS TO SMELTER

A 15-mile, 10-inch line from Blackwell, Oklahoma, to the Gross farm in section 17-29-1e, one-half mile south of the Oklahoma-Kansas line, is expected to be complete early in December, being laid by Reece McGee for Harris & Haun. This line is to be used to carry gas to the Blackwell smelter.

MONTANA ASSN. MEETING ON DEC. 8 AND 9

Gas men of Montana will gather in Great Falls on December 9 for a two-day meeting, the third annual convention of the Montana Chapter, Rocky Mountain Oil & Gas Association. The meeting will have unusual significance to gas men due to the recent introduction of natural gas into Great Falls, as reported elsewhere in this issue.

Arrangements for the meeting are well under way, according to Walter F. Brittan, secretary of the organization.

PORTLAND UTILITIES MOVE TO NEW OFFICE BLDG.

Early in December the Portland Gas & Coke Company, Pacific Power and Light Company, and the Northwestern Electric Company will move into the new $1,500,000 Public Service Building which has been under construction in Portland since early in the present year.

The Public Service Building will be 220 feet in height, the tallest structure in Portland. It is of steel and concrete construction. Its location is on the east side of Sixth Street, between Taylor and Salmon Streets.

MERCO NORDSTROM DIVISION MANAGERS ON COAST

Comfort E Brown, manager Eastern Division, and E. D. Rogers, manager Southern Division, of the Merco Nordstrom Valve Company, in November spent some time in San Francisco in conference with the executive offices of the company, which are located in that city.

DISCUSS NORTHERN CAL. LINE FOR GAS CONSERVATION

Piping natural gas from Southern California fields to San Francisco was a possibility discussed by Governor Young's commission on conservation of natural gas at a meeting held November 23 in San Francisco, with oil company officials present

A study of the problem of conserving or utilizing the 120,000,000 cubic feet of gas reported to be wasted daily will be made and discussed at another meeting of the commission, called for January 5.

GAS FOR LOUISIANA TOWNS

Several communities in Louisiana are soon to have natural gas served by the Richland Gas Company which has headquarters at Rayville, La. Meters were being set late in November at Mangham, and lines are rapidly going in at Winnsboro, Gilbert and Wisner.

PUBLIC UTILITY BOOK

Phillip Cabot and Deane W. Malott, of the Harvard University Graduate School of Business Administration have written a volume entitled "Problems in Public Utility Management", published by A. W. Shaw Company, New York and Chicago, and priced at $5.00.

HAS EQUIPMENT LINES

Morgan Washburn, Jr., with offices at 1855 Industrial Street, Los Angeles, is now personally representing two equipment lines formerly handled by the F. C. Millard Engineering Company, with which he was formerly associated. Mr. Washburn now represents C. Lee Cook Mfg. Company, Louisville, Ky. makers of graphite piston rings, metallic rod packings, and graphite iron castings; and Power Plant Equipment Company, Kansas City, Mo., manufacturers of cooling equipment and steam superheaters.

OKLAHOMA GAS & ELECTRIC CO., HOUSE HEATING DEPARTMENT HOUSE HEATING DATA SEASON OF 1926-'27

Job. No.	City	House Construction	Heat Loss 0° to 70° in B. t. u. per hr.	Number of Rooms	Contents in Cu. Ft.	Installed Radiation Sq. Ft. or Sq. In. Leader	Type of Installation	Rating in Sq. Ft. or B. t. u. per hr.	Thermostat Control Temperature Day	Thermostat Control Temperature Night	Maximum Hourly Demand Cu. Ft.	Annual Load Factor per cent	Estimated Consumption Normal Season	Estimated Consumption other than Heating	Heating Consumption 1926-27	Heating Cost 1926-27
1	Okla. City	1-Story Frame	125,963	7	14,706	767	Gravity Warm Air	136,260	72	55	170	7.3	200	49	109	$70.85
2	Okla. City	2-Story Frame	106,053	7	13,264	393	Gravity Warm Air	102,720	72	55	140	15.5	168	49	130	123.50
3	Okla. City	2-Story Brick and Hollow Tile Stucco	90,987	8	15,400	660	Gravity Warm Air	102,720	70	55	130	12.7	144	28	*144	93.60
4	Okla. City	2-Story Frame	106,159	8	14,498	725	Gravity Warm Air	136,960	72	55	140	10.6	168	35	*130	84.50
5	Okla. City	2-Story Frame	98,353	8	16,322	703	Gravity Warm Air	136,960	72	55	150	11.9	156	42	*156	101.40
6	Okla. City	2-Story Brick Veneer	161,280	12	33,486	732	Forced Warm Air	176,000	72	55	240	12.5	226	70	240	156.00
7	Okla. City	2-Story Frame Stucco	174,724	12	27,362	869	Gravity Warm Air	171,200	72	55	220	14.1	277	105	271	176.15
8	Okla. City	1-Story Brick and Tile	80,546	6	9,817	623	Gravity Warm Air	102,720	72	55	120	15.7	128	21	165	107.25
9	Okla. City	2-Story Frame	133,278	9	16,285	773	Gravity Warm Air	136,960	72	60	170	13.1	211	56	194	126.10
10	Okla. City	1-Story Brick Veneer	88,252	7	13,860	612	Gravity Warm Air	102,720	70	55	130	13.1	140	28	*149	96.35
11	Okla. City	2-Story Frame	122,191	10	20,360	634	Gravity Warm Air	136,960	75	55	170	7.8	194	35	**116	75.40
12	Okla. City	Aeroplane Frame	107,282	7	8,460	658	Gravity Warm Air	102,720	70	55	140	13.3	170	49	163	105.95
13	Okla. City	1-Story Brick Veneer	54,508	6	7,625	256	Floor Furnace	23,600	Man'l.	Con'l	30	21.1	86	27	58	37.70
14	Okla. City	3-Story Stone	372,921	18	72,847	1,934	1-Pipe Steam	2,925	70	70	600	10.4	591	70	548	322.00
15	Okla. City	2-Story Brick Veneer	116,429	10	19,714	587	2-Pipe Vapor	880	72	60	265	9.4	185	56	218	141.70
16	Okla. City	2-Story Brick Veneer	106,356	9	18,327	500	1-Pipe Vapor	875	70	55	250	5.4	169	21	119	77.35
17	Okla. City	1-Story 12" Brick	174,463	1	28,980	550	2-Pipe Steam	1,355	58	58	195	9.5	276	0	162	105.30
18	Okla. City	1-Story Brick Veneer	102,489	7	15,133	406	1-Pipe Vapor	630	72	55	190	11.7	163	28	195	126.75
19	Okla. City	1-Story 12" Brick	508,005	4	72,098	3,317	2-Pipe Vapor	3,855	70	55	1,165	6.0	806	0	614	365.35
20	Okla. City	2-Story Brick and Tile	201,392	11	35,134	1,444	2-Pipe Vapor	2,400	75	55	500	11.5	311	84	503	307.15
21	Okla. City	2-Story Frame	143,850	12	34,440	880	1-Pipe Water	1,500	72	60	250	19.8	228	70	434	281.20
22	Okla. City	2-Story Brick Veneer	163,959	10	29,388	838	1-Pipe Water	1,010	68	50	200	12.7	260	49	222	144.30
23	Okla. City	2-Story Brick Veneer	116,787	9	20,929	731	2-Pipe Vapor	750	75	60	200	17.4	185	70	304	197.60
24	Okla. City	3-Story Insulated Brick Veneer	192,447	15	38,366	950	1-Pipe Steam	1,050	72	55	300	11.5	234	70	303	196.95
25	Okla. City	2-Story Brick and Tile	174,680	10	24,608	935	2-Pipe Steam	1,115	72	55	335	7.9	277	35	231	150.15
26	Okla. City	3-Story Concrete	253,815	15	48,761	1,616	1-Pipe Water	2,010	72	60	375	13.5	403	84	443	279.40
27	Okla. City	2-Story Brick Veneer and Stucco	157,064	12	23,946	767	2-Pipe Vapor	1,260	70	55	375	10.0	249	49	327	212.55
28	Norman	2-Story 12" Brick	269,525	16	51,948	1,393	2-Pipe Vapor	2,600	70	55	475	12.9	427	70	538	107.60
29	Norman	3-Story Frame	171,993	15	28,818	778	2-Pipe Vapor	1,300	72	55	235	16.6	248	70	342	263.34
30	Norman	2-Story Brick Veneer	89,364	8	15,346	424	2-Pipe Vapor	525	70	55	150	13.2	142	35	*173	133.21
31	Norman	1-Story Brick Veneer	110,829	9	16,733	370	2-Pipe Vapor	630	70	55	190	8.9	176	35	148	113.96
32	Norman	2-Story Frame	155,499	9	22,783	645	2-Pipe Vapor	755	70	55	225	8.0	247	21	179	137.83
33	Norman	3-Story Brick and Tile	274,596	25	64,674	1,449	2-Pipe Vapor	1,750	72	55	400	17.9	436	490	627	245.10
34	Norman	3-Story Brick and Tile	211,082	14	36,961	777	2-Pipe Vapor	975	70	55	270	21.3	305	175	504	337.35
35	Norman	2-Story Frame	288,260	18	40,154	1,090	1-Pipe Vapor	1,225	72	55	350	10.4	456	280	320	232.15
36	Norman	2-Story Brick Veneer	124,333	11	18,072	590	2-Pipe Vapor	875	72	55	200	14.7	197	70	257	197.84
37	Norman	2-Story Brick and Tile	122,349	9	21,195	699	2-Pipe Vapor	875	68	60	200	8.8	194	28	154	118.58
38	Shawnee	2-Story Frame	121,989	7	15,951	710	Gravity Warm Air	136,960	70	55	160	11.3	193	21	158	93.22

*Consumption estimated part of season

**Not at home, operated at 55° part of season.

Factors *in* House Heating *with* Gas

(Continued from Page 35)

becomes necessary to determine the proper design temperature for the community in question. Good practice, as established by the Society of Heating and Ventilating Engineers, dictates that the design temperature should be about 15° Fahr. above the minimum temperature recorded during the past ten years.

The statement is often made that the public never forgets the day when conditions are such that proper heating of the home is impossible. If this be true, it becomes necessary for the gas industry to include in its program of education this matter of proper plant capacity, for certainly a heating plant, based upon the proper design temperature, functions at the highest possible efficiency and therefore at the lowest possible operating cost, which vitally interests the owner. Such a plant also gives the best possible load factor and the lowest possible maximum demand commensurate with good heating service, which vitally interests the gas industry.

Temperature and Pressure Regulation

Much gas designed equipment has been installed, both by the gas industry and the heating trade, without thermostatic control. Of all the injustices which have befallen house heating with gas, this is by far the most damaging one. Coal equipment when properly converted and thermostatically operated, will come nearer satisfying the customers' idea of an ideal heating plant than the best gas designed equipment hand controlled, and the operating cost with the former arrangement will be less in many instances than with the latter arrangement. It is indeed unfortunate that the heat regulator has not been considered an integral part of the gas designed equipment and absolutely necessary for its proper functioning. The success of house heating with oil can be attributed to the heat regulator, which is considered an integral part of the better oil burners in spite of the fact that the burning of oil is much more difficult to control thermostatically than the burning of gas.

Since the heat regulator is priced out and sold as a distinct and separate unit of the heating plant, it often becomes necessary to justify its cost. This is not difficult to do, even on a strictly business basis, for its presence will reduce the heating cost from 15 per cent to 30 per cent per season, which saving is a very good return on the investment in the regulator. Also the first cost of gas designed equipment, thermostatically controlled, is often no greater than the first cost of gas designed equipment hand controlled, due to the fact that hand controlled equipment requires greater capacity for quick heating than thermostatically controlled equipment, which additional capacity often means the next larger size of furnace or boiler.

From the gas industry's viewpoint, the thermostatically controlled heating plant is particularly desirable, for it operates on a lower maximum hourly demand with a corresponding increase in load factor. Also a greater diversity factor can be expected from thermostatic operation.

Another accessory which should always be included in the installation of gas designed equipment is the gas pressure regulator. Many manufacturers of gas designed equipment now include this piece of apparatus with the equipment. The gas industry realizes the value of the pressure regulator in obtaining the highest efficiency of combustion. The heating trade apparently does not appreciate the value of the pressure regulator, for most of their gas designed jobs are minus this inexpensive and valuable accessory.

The pressure regulator renders another valuable service which is of particular concern to the gas utility and this has to do with continuity of service. On the coldest days of the year, when the heating plant requires the greatest amount of gas, the pressure is usually quite low, especially at points fartherest from the centers of supply. This low pressure is usually sufficient to take care of the load, provided the house piping is of ample size and the gas equipment properly adjusted. With the pressure regulator adjusted for low pressure, two ounces or less, the house heating equipment will function properly long after other gas equipment, adjusted for average pressure conditions, fails to function. In other words, the heating plant equipped with a pressure regulator which has been properly adjusted for low pressure conditions has a distinct advantage over the heating plant not so equipped.

Better House Construction
Will Widen Heating Market

Gas designed equipment has reached the limit in practical efficiency and when functioning in a heating plant correctly designed and properly installed, the limit of efficiency has been obtained and therefore there is no more room for improvement in this direction. There is, however, considerable room for improvement in the matter of house construction, which has a direct bearing upon the cost of heating. This matter of house construction will have a marked effect upon the future of house heating with gas and for this reason it is of vital importance to the gas industry.

The cost of heating a house depends upon the design, type of construction and tightness. The bungalow design costs more to heat than the two-story house of equal volume. The house of standard frame construction costs more to heat than the house of brick veneer construction. The unweather-stripped house costs more to heat than the weather-stripped house, and the uninsulated house of any type of construction costs more to heat than the insulated house. It is in this field of house insulation that the greatest opportunity exists for reducing the cost of heating.

It is the general opinion in this locality that climatic conditions are such as to not warrant the use of insulating materials in the construction of residences. Naturally, this belief is due to the fact that the winters are comparatively mild and consequently the fuel bills are less than in colder climates. Also no credit is given the insulating material for its insulating properties in the summer time in making the house a more comfortable place in which to live.

In reality house insulation has a 100 per cent load factor in that it is functioning twenty-four hours each day and three hundred and sixty-five days each year, retarding the passage of heat from the home during the heating season and retarding the passage of heat into the home during the summer time. The reason house insulation has been given so little credit in making the home a more comfortable place in which to live during the warmer months of the year is because this value is an intangible one and therefore cannot be stated in dollars and cents, whereas its value during the heating season is tangible and consequently can be stated in dollars and cents of fuel saved. When houses are cooled by gas refrigeration this intangible value will become a tangible one.

In addition to reducing the cost of heating, house insulation also makes the home a more comfortable and safer place in which to live, in that the floor is much warmer and the temperature differential between the floor and ceiling less than in an uninsulated house. Other features of house insulation, the values of which are intangible, are its sound-deadening and fire-resisting qualities. No doubt in the future as the fire-resisting qualities of house insulation become better known, the fire insurance rate will be materially reduced on certain types of house construction.

It is the opinion of the gas industry that the solution of the gas house heating problem is in better built homes, well insulated, for such construction reduces the maximum hourly demand on the distribution system, places gas for house heating within reach of the average home owner and, last but not least helps to conserve the natural resources of this country.

The Venting Problem

(Continued from Page 31)

required to move the products through the flue.

Coming now to the data in which we are primarily interested, we find in the previously referred to article, published in the American Gas Association Monthly of June, 1926, the following statement on page 328: "As H (the height of the flue) increases, higher temperatures are usually encountered, and if so, the draft at the base is found correspondingly higher." This assumption may or may not represent average conditions. Certainly it is not true for a large number of installations, as I shall show later. Most flue connected appliances are equipped with a down-draft diverter and any draft above that necessary to carry away the products will merely draw in additional cold air through the draft diverter and reduce the temperature of the flue gases. To admit that a higher flue or chimney gives a higher flue gas temperature is also admitting that the heat loss from the appliance is greater and the appliance is operating at a lower efficiency.

The following principal factors determine flue and chimney capacity:

(a) Height of chimney.
(b) Cross sectional area.
(c) Shape; round, square or rectangular.
(d) Nature of inner surface; rough or smooth.
(e) Kind and thickness of material. (This determines the heat loss from the flue or chimney.)
(f) Type of construction into which the flue is placed. (This is another factor influencing heat loss from the flue.)
(g) Density of flue gases.
(h) Temperature of gases.
(i) Outside temperatures.
(j) Altitude.
(k) Length and size of vent connection.
(l) Location with respect to other parts of the building and in relation to other houses in immediate vicinity.

In the proposed specifications a very considerable increase in capacity is shown with increase in height of flue. The probable accuracy of this assumption will be discussed briefly and the importance of the other factors will be discussed in subsequent articles.

When the combustion products first enter the flue, the temperature rapidly drops and it takes a considerable time, perhaps an hour in the case of an exposed flue, for the temperature to come to an equilibrium. With a very small quantity of products entering the flue, a large percentage of the heat in the products is absorbed by the flue and the temperature of the products leaving the flue will be very low. With an increasing quantity of products going into the flue, the percentage of heat absorbed by the flue is gradually reduced until the maximum carrying capacity of the flue is reached.

As the volume is increased the friction is increased until at the point of maximum capacity there is no positive draft shown at the base of the flue. At this point the flue gases will have the highest average temperature but the heat loss in the flue will be the lowest percentage of the total heat in the products.

Actual measurement on a certain size of terra-cotta flue showed that with a 20-foot height it was possible to vent approximately 650 pounds of flue products per hour after the temperature had come to an equilibrium. Starting with an inlet temperature of 200 degrees it was found that the temperature drop was very small, the average temperature measuring about 192 degrees. With a 40-foot flue the average temperature measured 175 degrees. Although the hot air column with the 40-foot flue was twice as high as with the 20-foot flue, the "stack effect" was not doubled because of the reduced temperature of the products. The higher flue also introduced greater friction loss and the actual capacity was reduced to 500 pounds of products instead of increased.

Where the appliance is connected close to a flue, or the vent connection from the appliance to the flue has sufficient slope that the products are easily vented from the appliance without a positive pull of the flue, a short flue will carry away the products more readily than a tall flue. In other words, the higher flue will have less capacity than the lower one.

Suppose, however, that the length of horizontal run were such that a considerable amount of pull were required to get the products into the flue. With the shorter flue, the pressure drop in the horizontal vent connection becomes a larger percentage of the available draft and the capacity of the shorter flue becomes less in comparison with the higher flue. The preceding table has shown that a very short flue will have an extremely low "stack effect." With a considerable wind velocity, this small difference in pressure tending to carry the products out may very readily be overcome and cause a down-draft, while with a higher flue the flow of products may be merely retarded, but not sufficiently to cause a down draft.

Specifications for flues should be as simple as possible in order that they can readily be interpreted and easily applied. It is doubtful, however, whether the specifications can be simplified to the extent shown in the proposed requirements for it appears that they do not adequately take care of conditions where venting is difficult and on the other hand provide an unnecessarily large margin of safety where favorable conditions prevail.

The gas industry must give more thought to the venting problem because it has an important effect on the future of our industry. Where gas vents are installed these should insure the greatest degree of safty to the occupant of the home, the minimum degree of fire hazard and lowest possible construction cost to the builder. Capacities in excess of requirements are of no particular value, however, and the additional cost and difficulty of locating the vents, especially where the vents have to go into partition walls, may determine whether gas or some other method of heating is adopted.

(In a later article the writer will discuss some of the other factors that determine the effectiveness of venting, and also discuss the friction factor of several sizes of cement and terra cotta vents.)

COMPLETES REFUGIO EXTENSION

The Houston Pipe Line Company of Houston, Texas, has recently completed an extension of its gas line from the Refugio field into White Point field, San Patricio County, southwest Texas, and tested out the line that has already been tied into its main pipe line system running from southwest Texas to Houston, and nearby industrial centers. This makes the entire gas line system run a total distance of more than 600 miles.

BUYS UNION GAS CORP.

Commonwealth Power Corporation of New York has purchased the Union Gas Corporation, which supplies 22 towns in Kansas and Oklahoma, according to announcement in November.

Dehydration *of* Gas *by* Compression

(Continued from Page 29)

where condensation takes place. Further compression (or cooling) beyond the latter point will cause a reduction in the relative partial pressure of the vapor due to the removal of a portion of the latter from the mixture. The following formula was derived from the above:

$$P_1 = \frac{P_{v1}\ (P_2 - P_{v2})}{P_{v2} + P_{v1}}$$

where

P_1=Total absolute pressure of the gas mixture while under compression in the aftercooler.

P_2=Absolute pressure of the gas mixture after expansion.

P_v=Partial pressure of water vapor in mixture at aftercooler temperature.

P_{v2}=Partial pressure of water vapor in the mixture at the pressure existing after expansion. (Vapor pressure of water at dew point temperature).

For example, assume that it is desired to find the pressure to which moist gas must be compressed, so that after re-expansion to 6 inches water column (0.22 lb. per sq. in. gage) pressure, the aqueous dew point will be 40 degrees Fahrenheit, the temperature in the aftercooler being 70 degrees. In this case

P_{v1}=0 3626 lb. per sq. inch (Vapor pressure water at 70 degrees.)

P_2=14.7+0.22=14.92 lb. per sq. inch absolute.

P_{v2}=0.1217 lb. per sq. inch (Vapor pressure of water at 40 Degrees)

Substituting in the Formula:

$$P_1 = \frac{0.3626\ (14\,92 - .1217 + 0.3626}{0.1217}$$

=44.5 lb. per sq. in. absolute, or 29.8 lb. gage.

The theoretical curves shown in Figure 1 were computed in the above manner. The curves in Figure 2 were also determined in this way and are for use in calculating the compression and cooling necessary to accomplish different degrees of dehydration.

In actual operation the pressure to which the gas must be raised in order to accomplish the desired dehydration will depend upon the amount of cooling possible in the aftercooler. The curves in Figure 3 simplify the determination of this pressure, and are based on the same formula as was used for computing the data in Figure 2.

In order to prevent the deposition of water in high pressure mains more moisture must be removed than is necessary for low pressure distribution. Figure 4 gives the relation between the compression and cooling required for maintaining a 40 degree dew point under different distribution pressures.

EFFECT ON HEATING VALUE AND VOLUME OF OIL GAS

The compression and cooling of manufactured oil gas often causes a reduction in heating value. Benzol (C_6H_6) may be present in sufficient quantities to reach its vapor pressure during compression and cooling, with the resulting condensation of the liquid.

The exact effect of compression on the B.t.u. content of gas cannot be predicted because of the several factors to be taken into account, concerning which definite in-

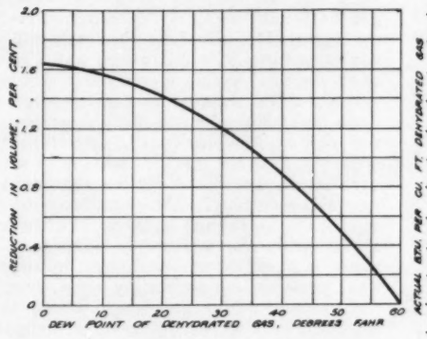


Fig. 7.

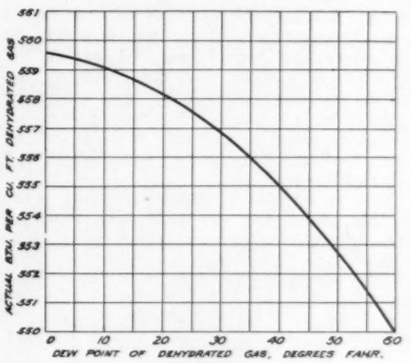


Fig. 8.

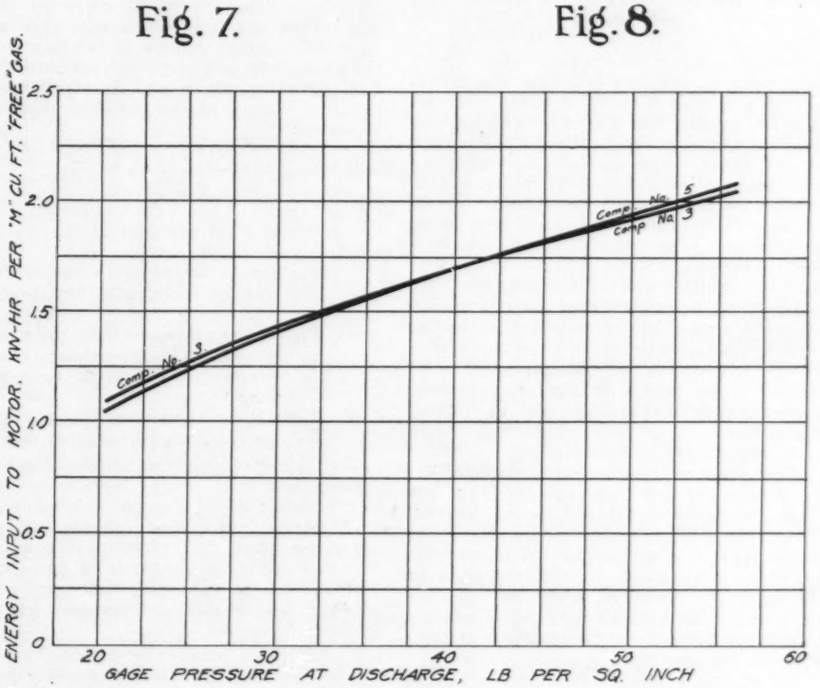


Fig. 9.

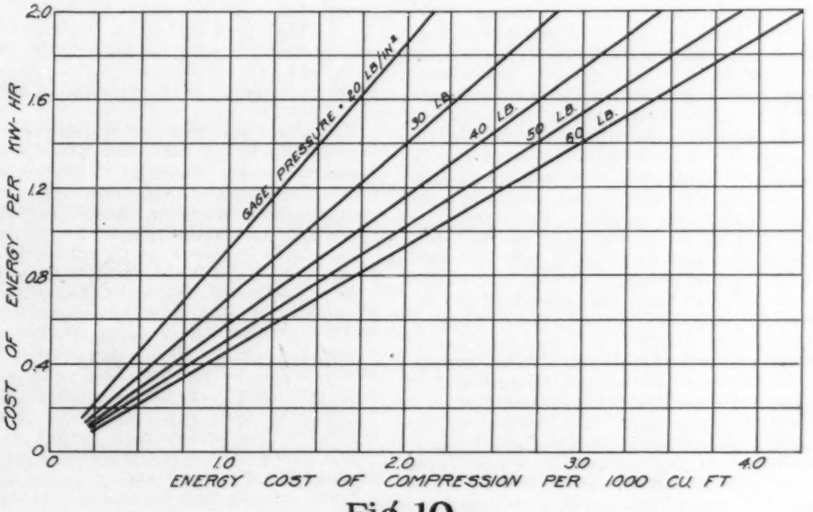


Fig. 10.

formation is lacking. In the first place the relative proportions of the constituents vary from time to time, even though the heating value of the total mixture may remain practically constant. In addition, there is no doubt a considerable quantity of each of the several constituents of the gas dissolved in the water and benzol removed during the dehydration process, and the result of this on the heating value of the gas would be difficult to predict. For these reasons a series of experiments was carried out by means of the laboratory compressor and aftercooler.

A large number of these tests were made during which the gas was compressed to different pressures and cooled to various temperatures and the reduction in B.t.u. content noted. The B.t.u. loss was determined as follows:

A Thomas calorimeter was operated on the low pressure gas just ahead of the compressor intake. Immediately before each experiment a careful check was made on the Thomas calorimeter reading by testing the gas in a Junkers calorimeter. Any difference between the two readings was noted.

The gas was then treated by compression and cooling and after re-expansion was tested in the original Junkers set. For each of the latter determinations a comparison was made with the heating value of the gas before compression as recorded by the Thomas calorimeter, but after the latter reading had been corrected to conform with the calibration of the Junkers instrument. Any loss in B.t.u. content was recorded.

The tests were conducted over a period of about a year in order to obtain average results. In this way the effects of variations in the composition of the gas were minimized. The curves in Figure 5 indicate approximately the average loss in heating value to be expected for different pressure and temperature combinations.

The average relation between the depression of the dew point and the B.t.u. loss during dehydration should be of interest. The curve in Figure 6 gives this relation as found from the test results. These results failed to indicate any definite variation in the values for the curve, where the same depression of the aqueous dew point was accomplished by different combinations of compression and cooling.

All of the heating value tests made in connection with this work are on the basis of gas saturated with water vapor. This is necessary in order to compare results before and after dehydration, and to conform to standard practice. There was some doubt at first as to the degree of re-saturation of the dehydrated gas as it passed through the wet test meter of the Junkers calorimeter. Dew point tests were made which showed that the gas became practically saturated inside the meter. It was also found that the Bureau of Standards had conducted experiments* which showed that when dried gas was passed through a wet test meter, the gas was actually metered at the temperature indicated by the thermometer in the meter and that it had become practically saturated at that temperature.

On the other hand, the dehydrated gas delivered to the consumer will actually have a higher B.t.u. content per cubic foot than is shown by the Junkers tests. This is because of the absence of the inert water vapor in the gas when metered for consumption in a dehydrated condition. The volume of the gas will be reduced by the drying process according to the amount of water vapor taken out and the increase in heating value may be computed from this reduction in volume.

The curves shown in Figures 7 and 8 give the actual effect of dehydration on the volume and heating value of a gas, and are based on the following:

At constant temperature, the volume of a gas varies inversely with its pressure. According to Dalton's Law this will apply to any constituent of a mixture of gases as well as to the total pressure. In other words we may say: The volume of a gas mixture will vary inversely with the partial pressure of any one of its constituents, temperature remaining constant. This will be true regardless of the reason for the change in the partial pressure of that constituent so long as there is no change in the total quantity of the latter in the mixture in question. If a vapor is partially removed from the mixture, total pressure remaining the same, the partial pressure of the gas must increase by an amount equal to the decrease in the partial pressure of the vapor. It is only necessary, therefore, to find the partial pressures of the gas before and after dehydration, and multiply the original volume of the mixture by the ratio of the initial partial pressure to the final partial pressure. and the result will be the final volume of the mixture. This may be stated:

$$\frac{P - P_{v1}}{P - P_{v2}} \times V_1 = V_2$$

where

P=the total pressure of the mixture, lb. per sq. inch.

P_{v1}=the vapor pressure of the moisture in the gas before dehydration.

P_{v2}=vapor pressure of the moisture in the gas after dehydration. (Vapor pressure of water at dew point temp.)

V_1=the initial volume of the mixture.

V_2=the final volume of the mixture.

The following is given as an example:

One cubic foot of gas is saturated with water vapor at 60 degrees Fahrenheit and 14.73 pounds per square inch absolute pressure. Required the reduction in volume if the dew point is lowered to 40 degrees Fahrenheit, the gas being measured at the original temperature and pressure. In this case we have

P=14.73 pounds per sq. inch.

P_{v1}=0.256 pounds per sq. in. (vapor pressure water at 60° F).

P_{v2}=0 1217 pounds per sq. in. (vapor pressure at 40° F).

V_1=1.0 cu. ft.

substituting

$$V_2 = \frac{(14.73 - 0.256)}{(14.73 - 0.122)} \times 1.0 = 0.991 \text{ cu. ft.}$$

which corresponds to a reduction in volume of 0.9 per cent.

The actual heating value of dry gas which tests 550 B.t.u. per cubic foot after re-saturation with water vapor at 60 degrees Fahrenheit is shown in Figure 8. This curve was computed from the change in volume resulting from dehydration.

RECOVERY OF BENZOL

The condensate from the gas consisted principally of a mixture of oil and water which separated within a few minutes after removal from the drip. Distillation tests were made in which about 58 per cent of the total condensate collected went over below 95 degrees Centigrade. The odor of these lower fractions was that of benzol, and it would appear that approximately 50 per cent of these samples was benzol.

Since the oils may be so easily separated from the water of the condensate, the recovery of benzol should be a simple matter where enough is removed during dehydration to be important. The product obtained could be marketed as motor fuel, or, as would probably be more profitable, be put back into the gas.

COST OF COMPRESSION FOR DEHYDRATION OF GAS

As explained in the introduction, the additional compression necessary for dehydration under the conditions existing at San Diego may be accomplished with practically no increase over the present labor and maintenance costs. The cost of dehydration will therefore be very little more than the cost of the additional power required.

In order to determine the power required for the compression of gas at San Diego, tests were made on compressors installed at the plant. The compressors were not overhauled before these tests because it was desired to find the average power consumption, rather than that for ideal conditions.

The compressors tested are Ingersoll-Rand direct connected electric driven single stage machines. Compressor number 3 is size 28x27, with an 800 h. p. General Electric Synchronous Motor and is rated as follows:

Piston Displacement	5720 cu. ft. per min.
Intake Pressure	0 lb. per sq. in. gauge
Max. Discharge Pressure	60 lb. per sq. in.
Speed	150 R.P.M.

Compressor number 5 is size 34.5x30 with a 950 h. p. motor. This machine has the following rating:

Piston Displacement	8830 cu. ft. per min.
Intake Pressure	0 lb. per sq. in. gauge
Max. Discharge Pressure	60 lb. per sq. in.
Speed	138.5 R.P.M.

Tests were made on each of the above compressors while operating at full capacity against discharge pressures varying from 20 pounds per square inch gage to about 55 pounds per square inch. The gas compressed during the tests was taken from a holder which had been carefully calibrated. The amount of gas compressed was determined from readings taken on the holder, corrections being made for temperature and pressure. The inner lift only was used and temperatures were averaged from several points inside the holder. The tests were made at night so that temperature variations would be small.

The electrical energy used in compressing the gas during the tests is given in Figure 9 on a basis of kw-hr per thousand cubic feet of free gas. To these energy curves or those applicable to other plants, local costs of energy may be applied and the cost of compression thus deduced. The energy cost curves in Figure 10 are based on the average efficiencies of compressors 3 and 5 at the San Diego Plant.

CONCLUSION

The causes of corrosion vary in different places and are the source of considerable dispute. Oxygen and carbon dioxide, together with compounds of sulphur, ammonia and hydrogen cyanide are usually held responsible, but in every case liquid water is an essential agent of corrosion, without which the others would be innocuous. Interior corrosion, regardless of its cause, may therefore be checked by dehydration and the consequent elimination of water from the interior of the distribution system.

Dehydration by compression is commercially feasible, especially in mixed pressure plants which have compressors always in operation and of sizes larger than required most of the year.

(*) Tech. Paper No. 36, U.S.B.S. 1914, Pg. 30.

Natural Gasoline Output Slightly Exceeds Use

GEO. L. Ratcliffe, president of the California Gasoline Association, in his president's address opening that organization's Fall Meeting at Los Angeles on November 15, had the following to say regarding conditions of over-production in the California natural gasoline industry:

"At the present time the natural gasoline industry in the State of California is suffering somewhat from an over-production of natural gasoline. Our condition in that respect, however, is not nearly as serious as it is in the Mid-Continent. According to the latest figures available (those for the month of September), California was producing an average of 1,415,000 gallons of natural gasoline per day. During the same period approximately 1,365,000 gallons per day of this production was utilized, leaving the excess production of approximately 50,000 gallons per day to go into storage. This excess of 50,000 gallons per day represents four per cent of the amount at present being utilized per day. At the end of September there was approximately 33,000,000 gallons of natural gasoline in storage in California, which, at the current rate of utilization amounts to only about 24 days' supply. However, it must be borne in mind that this quantity of natural gasoline—800,000 barrels—presents rather a difficult storage problem due to the fact that it is not economically feasible to store such a commodity by itself in ordinary steel tankage.

"The natural gasoline which is utilized is primarily used in blending with straight run gasoline or blending distillate to produce a finished motor fuel. If all of the natural gasoline produced in California during the month of September had been blended into the total finished motor fuel produced in California during the same period, the motor fuel produced would have contained an average of 20 per cent of natural gasoline. If we assume that all of the natural gasoline utilized in California during September was actually blended into the total motor fuel produced during September, we find that the motor fuel produced contained an average of only 19 per cent of natural gasoline. In these figures cracked gasoline has not been included in the total motor fuel produced in the State. From these figures, therefore, it will be noted that if the percentage of natural gasoline used in the finished motor fuel could have been increased one per cent in September, consumption would have equaled production. This condition would not be alarming except that all indications point to the fact that the percentage of natural gasoline available for blending into finished motor fuel is more apt to increase in the future than it is to decline. Inasmuch as it is difficult to store large quantities of natural gasoline economically, it is of vital importance that ways and means be found to utilize the surplus which is and will probably continue to be produced. Perhaps this surplus can be taken care of by increasing the percentage of natural gasoline blended into motor fuel, or perhaps it will be necessary to develop other uses to take care of it. Manifestly the production of natural gasoline could be decreased and the same result achieved by removing only the more stable portion of the gasoline from the gas, but while this may be temporarily advisable in some cases it does not seem to me to be economically sound because the gasoline which is not recovered from the gas cannot be again recovered."

NATURAL GAS GASOLINE OPERATIONS

Compiled by E. T. Knudsen

Department of Commerce, Bureau of Mines, Division of Mineral Resources and Statistics

ONE hundred and thirty-four natural-gas gasoline plants with a daily indicated capacity of 1,387,950 thousand cubic feet, report a recovery of 43,460,334 gallons of natural-gas gasoline from 29,048,437 thousand cubic feet of gas treated in October. This is a decrease of 308 barrels in daily average production.

Utilization of natural-gas gasoline amounted to 1,035,292 barrels, an increase over September of 58,963 barrels. Daily average utilization of 33,397 barrels was 17 barrels more than daily average production of 33,380 barrels.

Stocks of natural-gas gasoline at the end of October amounted to 782,485 barrels of which 31,787 barrels were reported by natural-gas gasoline plant operators and 750,698 barrels by refinery operators. This is a decrease of 522 barrels under September stocks. This stock figure of 782,485 barrels is approximately twenty-three and one-half days' supply at the current rate of consumption.

Production of gasoline during the month of October amounted to 5,355,847 barrels, a daily average of 172,769 barrels. This is an increase in total production of 206,208 barrels or 4.00 per cent over September output and an increase of 982,433 barrels or 22.46 per cent over the output of October 1926.

Of the total gasoline produced 38,361 barrels were reported as finished gasoline produced by natural-gas gasoline plant operators. Production of gasoline from Cracking Processes increased in October to 366,063 barrels.

Stocks of gasoline show an increase of 404,896 barrels during October and at the end of the month amounted to 11,308,301 barrels. This stock figure includes 222 barrels of finished gasoline reported by natural-gas gasoline plant operators.

CALIFORNIA NATURAL GAS GASOLINE PRODUCTION, DISTRIBUTION AND STOCKS

OCTOBER, 1927

PRODUCTION

Type of Plant	*Gas Treated M.C.F.*	*Natural-Gas Gasoline Produced (Gallons)*	*Gasoline Recovery per M.C.F. Gas Treated*
Oil Absorption	18,838,133	28,356,938	1.505
Compressor	260,948	372,037	1.426
Combination Comp. and Oil Absorption	9,949,356	14,720,385	1.480
Drip	.....	10,974	.....
TOTALS	29,048,437	43,460,334	1.496

Finished Gasoline produced at plants—38,361 Bbls.

The "Charcoal Absorption" plants were shut down in October.

DISTRIBUTION

Stocks First of Month	.....		783,007	Bbl.
Production during Month	.....		1,034,770	"
Quantity Mixed with crude or Unfinished Oils	209,496	Bbl.	.....	
Used in Blending at Refineries	748,763	"	.....	
Stocks end of Month	782,485	"	.....	
Used at Plants, Shortage and Evaporation losses	9,500	"	.....	
Balance	67,533	"	.....	
TOTALS	1,817,777	"	1,817,777	"

STOCKS

Natural-gas Gasoline held by Natural-gas Gasoline Plant Operators	1,335,049	Gal. or	31,787	Bbl.
Natural-gas Gasoline held by Refiners	31,529,316	" "	750,698	"
TOTALS	32,864,365	" "	782,485	"

Finished Gasoline (Motor Fuel) held by Natural-gas Gasoline Plant Operators—222 Barrels.

LOREN MOORE MOVES UP

Loren Moore, salesman for the Southern Counties Gas Company in its Orange County District, Southern California, has been promoted to the position of district commercial agent by district manager C. E. Rutledge, to fill the vacancy created by the appointment of Fred G. Merker, formerly commercial agent in Orange County to district manager of Ventura.

McNEIL, ARK., TO BE SERVED BY ARKANSAS NATURAL

The Arkansas Natural Gas Company recently bought the Stephens Fuel Company, a distributing concern of Stephens, Arkansas, and is building 14 miles of gas line from Stephens to the company's main at Waldo. Gas from this line will serve the town of McNeil, Arkansas.

CORRIGAN VISITS BRICK PLANTS IN EAST

Eugene Corrigan of the Stockton Firebrick Company has recently returned from a three weeks' trip to the Atlantic coast, where he visited several of the large Eastern brick plants. His itinery included all of the larger cities on the eastern seaboard.

LONG BEACH GAS BLOWS WHILE HOLDER BUILDS

While Long Beach, Calif, rushes its city gas department's new holder to completion, the Petroleum Securities Company is blowing gas at Alamitos Heights—gas contracted for by the city. The gas is being metered so that Long Beach may be billed as per contract. The city is expected to contest payment in the courts.

Great Falls Gets Natural Gas

By A. H. SIKES

Manager, Great Falls Gas Company

IT has been known for a great many years that natural gas was obtainable in Northern Montana, but it was not until about ten years ago that a field was developed for public consumption. This first development was in the vicinity of Havre, but it was not a complete success on account of water flooding out the wells, and Havre did not have a thoroughly reliable source of supply until 1927, when natural gas was piped into the city by the Montana Gas Company from the Bowes Structure, which lies ten miles south of Chinook. Gas was piped into Chinook at the same time. Both of these cities now have an ample supply and excellent service.

GAS FOUND NEAR SHELBY

About five years ago gas was found six miles northeast of Shelby by the Ohio Oil Company and was piped to the city of Shelby, where it has since been distributed by the Great Northern Utilities Corporation. Two wells were drilled in this development and they are both connected with the transmission line so that either one or both can be used, as desired.

Since the discovery of the first two wells in the vicinity of Shelby by the Ohio Oil Company there has been more or less drilling and other gas wells have been discovered in this area, but it was not until the first part of 1927 that a serious movement was made to develop enough gas to serve the city of Great Falls and the reduction works of the Anaconda Copper Mining Company. The first movement for the development of the field was the organization of the Northern Natural Gas Development Company by Messrs. Burks, Rice and Esmay. This company contracted with the Hope Engineering & Supply Company for the sale of such gas as was developed and the transportation of it to Great Falls, and in turn the Hope Engineering & Supply Company, through their subsidiary, the Montana Cities Gas Company, contracted with the Great Falls Gas Company for the retail distribution of the gas, with the exception of such gas as will be used by the Anaconda Copper Mining Company.

The Northern Natural Gas Development Company owns or controls 19 producing wells and at the present time of writing, on November 1st, are drilling three more. There are five more wells in the developed district which are not controlled by the producing company. The field which has been tested lies at a distance of from two to ten miles northeast of Shelby and comprises 42 square miles. In all of the drilling which has been done in this territory this summer no dry holes have been found. The average thickness of the gas sands is 23 feet and the developed territory is estimated to contain 96,000,000,000 feet of gas, of which 73,000,000,000 cubic feet is recoverable. The wells have averaged a depth of 1,400 feet and have cost an average of $7,000 each.

GREAT FALLS LINE

The transmission line from the field to Great Falls starts about twelve miles east of Shelby and extends in a southeasterly direction and enters Great Falls at the northeast end of the Tenth Street bridge. From the point of beginning, there are branches or gathering lines connecting up all of the wells with the main line. These gathering lines are about 85,000 feet long and the transmission line is between 85 and 90 miles. The line is 12-inch steel pipe, with a tensile strength of 600 pounds per square inch. With the exception of the river crossings, where the joints are welded, the joining is done with Dresser couplings. The pipe is buried in the ground three and a half feet. At the crossing of the Marias and Teton Rivers the pipe enters a saddle and three lines are run across the rivers, each line being valved so that in case of accident on the river crossings three lines would have to go out before service was injured. The pipe is held to the bend of the river with 600-pound cast iron saddles placed over each joint of pipe. Each well is equipped with a blowoff valve, a line valve, drains, drips and a meter so that any well may be cut out of the line at any time.

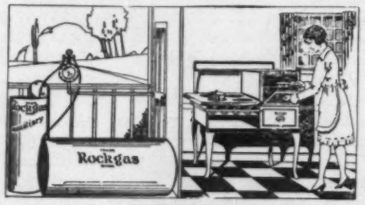
The gas will be reduced in pressure at the entrance to the city to about 50 pounds per square inch and will be carried across the Tenth Street bridge in a 14-inch line to a secondary regulator station located in the grounds of the Great Falls Gas Company, where it will be further reduced to a pressure of approximately 10 pounds per square inch for city distribution. Further reduction of pressure will be made to about three ounces by a regulator on each installation.

An analysis of the gas shows that there is from 92 per cent to 94 per cent Methane and that it contains no sulphur, so that it is completely odorless. It contains 1,020 B.t u. per cubic feet. The gas is absolutely dry and cannot freeze.

USE IN GREAT FALLS

Great Falls furnishes an exceptional market for the sale of natural gas. When the business is developed the general city distribution will require about 2,000,000,000 cubic feet of gas per year and the Anaconda Copper Mining Company as much more. There will be about 7,000 meters in the city and probably most of the house heating will be done with gas.

Pave the way for gas extension by installing



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BLUE STAR GROUP FORMED IN ST. LOUIS DISTRICT

"The Blue Star Group of the Forty-ninth State" is the name chosen to designate an organization newly formed by representatives of the Laclede Gas Light Company, St. Louis, Mo.; the St. Louis County Gas Company, and the Illinois Light and Power Company, East St. Louis, Ill. Meeting in St. Louis on November 2, with A. E. Higgins, field representative of the American Gas Company, the representatives of gas company commercial departments in this section decided to organize to promote the Blue Star program in their territory. Monthly meetings will be held in St. Louis.

Officers of the organization, which includes St. Louis and the 150-mile area around it, are W. L. Jones, commercial manager St. Louis County Gas Company, Webster Groves, Mo., chairman; W. H. Matlack, Illinois Power and Light Company, vice-chairman; J. J. Burns, Laclede Gas Light Company, secretary.

SUMMERS AND MERKER IN NEW SO. COUNTIES POSTS

Promotion of Carl Summers, district manager of the Ventura County, Calif., properties of the Southern Counties Gas Company, to manager of the gas production department of that utility, was recently announced by the general office in Los Angeles, and took effect on November 7th.

Fred G. Merker, formerly district commercial agent for the Southern Counties in Orange County, has been chosen to succeed Mr. Summers as Ventura district manager and assumed his new duties on the above date.

Carl Summers has been in the employ of the Southern Counties Gas Company since 1915, having had considerable experience in gas production. Mr. Merker has been employed by the Southern Counties in its Orange County territory since 1919.

LARGE SENDOUT REGISTERED BY HOUSTON PIPE LINE CO.

Sales of natural gas by the Houston Pipe Line Company for October aggregated 2,692,000,000 cubic feet, which is an increase of 63 per cent over the sales for the corresponding month of 1926. This sale ran the total sale for this year to approximately 24,300,000,000 feet, which is expected to increase to 30,000,000,000 by the close of the year—an expected increase of more than 75 per cent over 1926 sales of gas.

ROPER REPRESENTATIVE

J. C. Mansfield will represent the George D. Roper Corporation, gas appliance manufacturers, in Texas, with headquarters in Dallas.

Adjusting Appliances *for* Natural Gas

(Continued from Page 24)

equipment or with water heaters. Many water heaters were found with very poor adjustment, operating with an illuminating flame, the chilled surface of the boiler or coil causing a deep deposit of soot. In some cases the heaters were out of service, the consumer finding it impossible to light same, or dangerous to attempt to use the heater. The adjusters in all such cases cleaned the combustion chamber and placed the heater in operation, much to the satisfaction of the user.

On ranges, particularly oven burners, there were many instances in which obstructions were found in the burner bar. These are small castings placed there originally to hold the core at time of casting burner. Adjustment would be impossible so long as such an obstruction lay in the path of the gas; many such burners were out of service, and it was with satisfaction that the consumer observed the adjuster put the burner in proper operating condition.

On the whole, the consumer does not experience difficulty in operating a gas appliance. Through neglect appliances get in rather poor condition, and good results are not to be had under the circumstances; the user will put up with the situation, thinking all the time that the fault lies with the gas. Many express themselves accordingly, and in such a state of mind are an easy prospects for other fuels or electric ranges. This situation is offset by the appliance adjuster placing the gas equipment in operating order, and impressing the consumers with the fact that the utility is anxious to assist them in the proper use of their appliances.

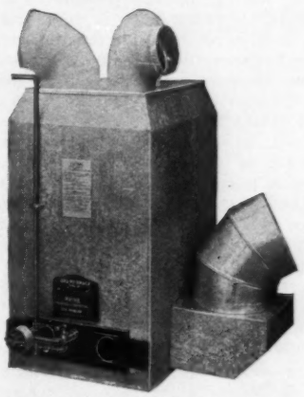
Under the supervision of the company's new business department, a complete gas appliance display is maintained. The sale of appliances is not the purpose, the idea being to assemble all the popular types of domestic equipment where they may be viewed by the consumer. This exhibit is in charge of competent advisers who demonstrate for the visitors' benefit the utilization of the different types of appliances.

An invitation is extended to all consumers by the men on the appliance adjustment survey to visit the display room, and a very satisfactory response has been had from this source. Interest thus created has, in many cases, been converted to a sale for some local merchandiser. To follow up on many prospects, a plan has been developed that bids fair to create a sale for new gas appliances, and introduce consumers to the convenience and joy of new equipment. All the completed work tags are checked, and a report compiled of each consumer not fully equipped with gas. If the report indicates that the consumer is a prospect for a particular appliance, note is made of such, and a list of these consumers is then submtited to a dealer in the vicinity. Only one dealer gets the name of a consumer, and follows up the lead, endeavoring to interest the consumer and convert him to a purchaser. This idea has just been put into practice, so results are not available, but it does show indications of proving quite satisfactory.

NATURAL GAS POSSIBLE FOR WATSONVILLE, SANTA CRUZ

Drilling now proceeding near Watsonville, Calif, is designed to develop a natural gas supply for that community and for Santa Cruz. J. A. Dorsey, T. A. Piper and Allen R. Campbell are conducting the undertaking.

Increase Your Sales by Pushing a Leader... The PAYNE Gas Furnace



The use of the Blue Star is permitted only on appliances approved by the A.G.A. Testing Laboratories for efficiency, reliability and performance.

Sales resistance is lowered when you push a leader.

The Payne Gas Furnace was the first to be approved by the American Gas Association Laboratory. It also complies with the specifications established by the U. S. Bureau of Mines, the U. S. Public Health Service, the U. S. Bureau of Standards. For fourteen years it has stood the actual test of performance in more than thirty thousand installations.

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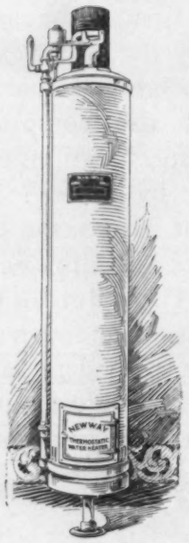

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In the New Way the pilot light heats the water in the coils,—always—there is no reheating of the coils and heater every time the hot water faucet opens.

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SAN FRANCISCO

Effect *of* Barometric Pressure *on* Measurement

(Continued from Page 40)

permits of the use of the present pressure extension tables, is to make the necessary adjustment to the gauge. If the barometric pressure is below 14.4 pounds, set the static pressure pen a space below the zero line on the chart equal to the difference between the barometric pressure and 14.4 pounds. If the barometric pressure at the point of measurement is greater than 14.4 pounds, set the pressure pen above zero a space equal to the difference between the barometric pressure and 14.4 pounds.

For example: when the barometric pressure is 12.2 pounds per square inch, set the static pen 2 pounds below zero, when the gauge is open to the atmosphere. When a pressure is applied until the gauge shows a pressure of 20 pounds, the absolute pressure is (20+2) +12.4=34.4 pounds. By making this adjustment to the static pressure pen, a static pressure is recorded that corresponds to the absolute pressure used in calculating the pressure extension tables now in use and based on a barometric pressure of 14.4 pounds. Consequently, if the static pressure pen is adjusted to make the necessary allowance between the barometric pressure at the point of measurement and 14.4 pounds per square inch as suggested, the pressure extension tables may be used with no other correction to obtain correct volumes. This method of making corrections for the barometric pressure is satisfactory where measurements are made under pressure; but in cases such as the measurements from heading wells, where during part of the time the gas is under a pressure and part of the time under a partial vacuum, it is not to be recommended. It has been tried on compound springs, but the results have not been satisfactory.

Due to a wide range of the static pressure variations, or other reasons, it might not be advisable to use either of the above methods of making corrections. In such cases, a method of calculating volumes with a slide rule may be resorted to. A slide rule has been devised that can be obtained in graduations suited to any barometric pressure and the volumes obtained with this rule are correct for the particular barometric pressure for which it has been calibrated, no further corrections being necessary.

The committee has given considerable thought to the making of changes in barometric pressures for use under the radical, and make the following recommendations for establishing the average barometric pressure:

First: That the average barometric pressure, for use under the radical, be changed for each 250 feet in elevation.

Second: That the average barometric pressure to be used under the radical, be the average barometric pressure of the point midway between the 250 foot stations.

For example: The average barometric pressure at an elevation of 125 feet would be the barometric pressure for use under the radical for all meters between sea level and an elevation of 250 feet, and the average barometric pressure at an elevation of 375 feet would be the barometric pressure for use between 250 feet elevation and 500 feet elevation.

Using this suggested method, the greatest error would only be that due to the difference in absolute pressures, as they would be affected by a difference in elevation of 125 feet. Except in cases of very high vacuum this is negligible. At 20 inches of vacuum this amounts to 0.7 per cent, at sea level, and 1 per cent at 4,000 feet elevation. At atmospheric pressure, the maximum error is 0.2 per cent for the same range of elevations.

It is obvious that difficulties may be encountered in arriving at the average barometric pressures to use under the radical at various elevations. Due to monthly and seasonal changes, it would be impractical to take a barometer to the meter station to determine the barometric pressure. Even an average of readings, extending over a short period of time, would be unsatisfactory.

Mr. F. A. Hough, in a paper presented before the Pacific Coast Gas Association, September, 1927, suggested a method of determining the average barometric pressure, for use in connection with orifice meter measurement. It is entirely practical, and if adopted, would eliminate all of the difficulties encountered in arriving at the absolute pressure.

The method suggested by Mr. Hough follows:

To facilitate the using of true absolute pressures in calculating orifice meter data, the chart shown in Figure I (See Page 40 of this issue, for Figure I) has been plotted. This chart gives values for the barometric pressure at elevations ranging from sea level to 7,000 feet, and is applicable, the commtitee believes, to all points in Southern California where orifice meters are used. The data for this chart were obtained as follows: From the United States Weather Bureau in Los Angeles, the average barometric pressure for the period from 1878 to 1924 was obtained, as well as the average temperature for the same period. The assumption was then made that the average temperature at all other points in Southern California is the same as that of Los Angeles (a rather large deviation from this assumption would cause a negligible error in the barometric pressure reported) and that the average barometric pressure for all points in Southern California differs from that of Los Angeles only because of differences in elevation. The elevation of the weather bureau was obtained and the barometric pressure for a series of elevations was calculated by means of the following formulae taken from Smithsonian Physical Tables, 7th Revised Edition, page 145.

$$Z = C\ \frac{(B_0 - B)}{(B_0 + B)}$$

$$C\ (\text{in feet}) = 52494\ \left(\frac{1 + t_0 + t - 64}{900}\right)$$

In which Z=difference in height of two stations in feet,

B_0=Barometric pressure at the lower station in inches of mercury,

B=Barometric pressure at the upper station in inches of mercury,

t_0=Temperature at the lower station in °F, and

t=Temperature at the upper station in °F.

Sample calculations:

Average barometric pressure at Los Angeles=29.619 inches mercury.

Average temperature at Los Angeles= 62.5 °F.

Elevation of barometer at Los Angeles= 361 ft.

Elevation of upper station=600 ft.

Average temperatuure at upper station= 62.5 °F.

$$C = 52494\ \left(\frac{1 + 62.5 + 62.5 - 64}{900}\right)$$

$$C = 56052$$

Transposing the equation $Z=C\frac{(B_o-B)}{(B_o+B)}$

we find that

$$B=\frac{(C-Z)\,B_o}{(C+Z)}$$

$$B=\frac{56052-(600-361)\times 29.619}{56052+(600-361)}$$

B=29.368 In. Hg.=14.42 pounds per square inch.

To determine the average barometric pressure at any meter station, it is only necessary to look up the elevation of the meter on a contour map and then read from the chart the barometric pressure corresponding to the elevation of the station. This procedure will doubtless give a value nearer to the average barometric pressure than could be determined by a few observations at the meter by means of an aneroid barometer, and the labor involved is less. If a chart, such as this one, could be generally accepted as standard, disagreement among various companies as to the average barometric pressure at any given point, could be eliminated. A useful figure disclosed by this chart is that a difference of 100 feet causes a difference in barometric pressure of approximately .05 pound per square inch of .1 inches of mercury.

"Creative Selling"

(Continued from Page 44)

100 per cent realization of the appliance sales market in its territory:

Dollar Value To Dealers		
Present water heater rep'td. Sales	$1,880,000	
Possible increase (since this is 60 per cent annual potential sales)	1,255,000	
Total possible water heater sales		$3,135,000
Present gas range rep'td sales	$3,540,000	
Possible increase (since this is 63 per cent annual potential sales)	2,010,000	
Total possible range sales		5,550,000
Gross total possible annual range and water heater sales		$8,685,000

Dollar Value to P. G. and E.

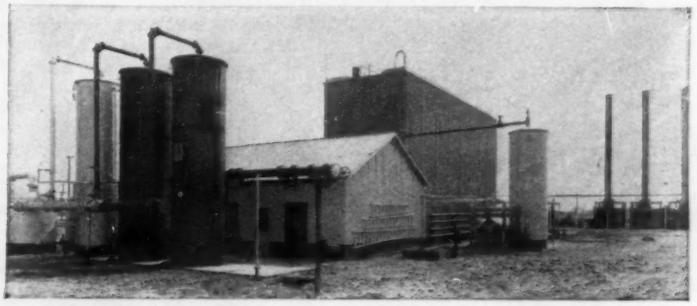
Estimated annual revenue to P. G. and E., based on possibilities of:

1. Correction and regaining loss in domestic consumption per consumer	$ 300,000
2. Selling unsold water heater field	2,131,800
3. Selling unsold gas ranges	2,340,000
	$4,501,800

SERVICE INFORMATION GIVEN CUSTOMERS IN BOOKLET

The Coast Counties Gas and Electric Company, San Francisco, has recently distributed a new booklet to all of its customers, containing complete service information, as is explained in the foreword, on the following subjects: Deposits; How and Where Bills Should be Paid; Where to Apply for Improvement in Service; What Gas Is; Gas Meters and Bills; How to Read Your Gas Meter; What to Do When You Suspect a Leak; What to Do if Not Getting Sufficient Gas; Suggestions for Saving Gas; How to Regulate the Gas Flame; Keeping the Burners Clean; Vented Appliances; Public Service.

This is probably the most complete and inclusive of the many pieces of literature on gas and electric service that the Coast Counties has mailed out, in its consistent campaigning for good public relations on its system.



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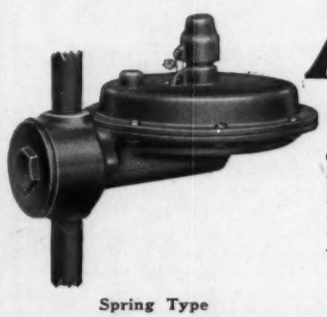

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Products for all kinds of Pressure Reduction—for either artificial or natural gas.

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REGULATORS—High Pressure Service, Low Pressure Service, High Pressure Line, Single and Double District Station.

VALVE—Automatic Quick Closing Anti Vacuum.

REYNOLDS GAS REGULATOR COMPANY
Anderson, Indiana

The Cleveland Trencher Company

"Pioneers of the Small Trencher"

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Governors—

—Automatic
—Balance
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—District
—Reverse Flow
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Oxide Purifying Material Equipment

Back Pressure Valves
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Connelly Iron Sponge & Governor Co.
NEW YORK CHICAGO
C. B. Babcock Co.
135 Bluxome St., San Francisco, Cal.

The Human Equation *in* Accident Prevention

(Continued from Page 26)

patience of the best.

However, progress is being made. Many records could be cited of plants and even industries which have been able to run days, months and even years without a lost time accident. Let it be understood that the favored records are not "luck" but are achieved only after months and sometimes years of patient, plodding effort by pay-roll and salaried men alike; safety education must come first and then the *safety spirit* before the goal is reached.

Accidents can be eliminated—not only those we always knew how to avoid but even those we have been pleased to term "unavoidable."

Last year the Pacific Gas and Electric Company reduced the frequency and severity of its accidents 16 and 44 per cent respectively. Indications are that this year's figures will show better results. The cost of accidents the first half of 1927 was $60,000 less than the first six months of 1926.

You ask how we do it? By educating the personnel, with the aid of a safety organization, to the truth that there is no such thing as an "unavoidable" industrial accident.

COOKING COURSES ON SO. COUNTIES SYSTEM

Miss Willa Campbell, home service demonstrator for the Tappan Stove Company of Mansfield, Ohio, is conducting a series of free cooking courses in several of the larger cities served by the Southern Counties Gas Company, Los Angeles. A very successful school was held in Ventura, November 15 to 18. Santa Barbara has just concluded a four day course in modern cookery and this coming week Miss Campbell will be in Anaheim. Then she goes to Orange, Santa Monica, San Pedro and Fullerton.

SOUTHWESTERN GIVES DETAILS ON NEWTON PURCHASE

Preliminary report of the purchase of control of the Newton Process Manufacturing Company of Fullerton, California, by the Southwestern Engineering Corporation of Los Angeles, made in these columns last month, can now be supplemented by the following information. The deal was negotiated by R. D. Clarke and D. W. Newton of the Newton Process Manufacturing Company, B. M. Snyder representing the Southwestern Engineering Corporation.

On the new board of directors are A. B. Menefee, H. Schwartz, Julius Kobernik, Frank W. Newton, G. W. Burnett and B. M. Snyder. Management will be practically the same as the Southwestern Engineering Corporation and it is proposed to continue the manufacture of Newton equipment in virtually the same form as heretofore.

The Newton Process Manufacturing Company has specialized in the manufacture of absorption plant equipment since its formation in 1922. Its principal products are absorption towers, fractionating towers, stills, heat exchangers, condensers, gas coolers and accessory equipment for absorption plant use. No change will be made in the manufacture of this equipment and Hurley Bros. of Tulsa, Oklahoma, will continue to represent the company for the sale of its equipment in the Mid-Continent oil fields.

The Southwestern Engineering Corporation now has offices in New York City as well as Tulsa, Okla., and has recently established a branch at Montreal, Quebec.

ANOTHER LARGE LINE IN OFFING—TO ST. LOUIS

Moody-Seagraves Corporation of Houston, Texas, are understood to be considering plans for constructing a 427-mile line to bring natural gas from northern Louisiana gas fields to St. Louis, Mo. Surveys for such a line, which would parallel the Mississippi River through Arkansas and Missouri, were reported nearly complete In November. According to report, the Dixie-St. Louis Gas Company has been formed as a subsidiary to operate the line, which would have a daily capacity of 200,000,000 cubic feet, and would be complete by next summer, weather conditions permitting.

HOUSTON DIRECTORS NAMED

At the annual stockholders meeting of the Houston Gulf Gas Company, Houston, late in November, the following directors were elected: O. R. Seagraves, W. L. Moody, E. L. Phillips, Frank J. Stolʻz, George Olmsted, E. G. Connett, J. A. Elkins, I. F. Vandorn, B. E. Heppler, C. B. Ewart, and Henry R. Frost.

FINISHING SANTA BARBARA DISTRICT OFFICE

The Southern Counties Gas Company's new $35,000 office building in Santa Barbara, Calif., is nearing completion and the formal opening is scheduled for January 3, 1928. The new structure is 50 feet by 100 feet with two stories, and will harmonize with the typical Santa Barbara Spanish architecture. It is constructed of reinforced concrete reinforced with steel and is both earthquake and fireproof.

NEW FLUE PIPE

Pacific Pipe and Insulation Company, San Francisco, have introduced a gas vent and flue pipe trade-named "Vitex"—a vitrified combination of materials resistant to fire, hot or cold acid, or water.

SELL GAS LIGHT POSTS

The city board of Kansas City, Mo., has authorized advertising for bids on 1,200 gas light posts scattered throughout the city, now to be sold, the purchaser to remove them.

Firing Sewer Pipe

(Continued from Page 33)

salt glazing process. However, considerable work in an experimental way is being conducted in plants located in some of the eastern states. There are several plants in Germany that are successfully doing this work with gas-fired continuous kilns.

Hollow structural materials include fireproofing terra-cotta lumber, hollow blocks and hollow bricks, flue linings, etc. The fireproofing materials are those which are employed in floor arches, partitions, and wall furring for girders and columns. Terra-cotta lumber is a soft and porous material produced by mixing saw dust with clay and subsequently burning it out. This, being soft, can be nailed the same as lumber. Hollow blocks are used for outside walls.

The burning process is conducted much in the same manner as for sewer pipe and telephone conduit, the material being similar in shape and size, though it does not require salt glazing or the same degree of vitrification. However, the building laws governing strength and durability are quite rigid and exacting, which emphasizes the fact that considerable care has to be exercised in its manufacture.

In subsequent articles more detail regarding clays in connection with firing will be given.

Michigan Gas Ass'n Opens Research Program

THE gas companies of Michigan through the fellowship committee of the Michigan Gas Association, have just employed a director of research and will launch an ambitious program of research on problems related to gas making, at the University of Michigan.

While the work will be financed and managed by the Michigan Association, the studies which are to be undertaken will be of application to the entire industry and the results will be made available to gas men everywhere.

The work will be conducted by Elmore S. Pettyjohn, who has just moved to Ann Arbor to take up his duties. Mr. Pettyjohn was graduated from the University of Michigan in 1918, with an A.B. degree, later receiving his Master's degree at the same institution.

Under the plan of procedure Mr. Pettyjohn will have available the laboratory and personnel resources of the department of chemical engineering at the University, for his studies. The assistance and counsel of Professor Alfred H. White, head of the department, will be at his disposal. Professor White has been identified with the fellowship program since its inception. In addition, Mr. Pettyjohn will be able to follow up his laboratory work with actual operating tests on any of the gas plants in Michigan.

This will be the second important gas research program to be inaugurated at the University of Michigan in one year. Early in 1927, The American Gas Association appropriated $10,000 a year for five years toward a study of gas for heat treating of metals. This work is now going forward under the direction of the Department of Engineering Research, conducted by Walter E. Jominy.

A LEADER IN RESEARCH

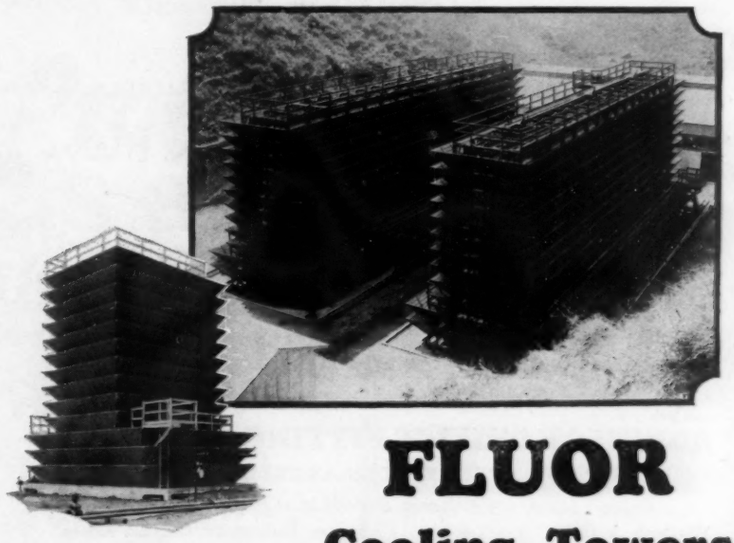
The Michigan Gas Association was probably the first in the United States to undertake and encourage systematic research. Since 1900 it has maintained a fellowship calling for expenditures of approximately $1,000 a year, for making studies in various processes used in gas plants. The work has continued for more than a quarter of a century, interrupted only by the late war and resumed immediately afterward. The estimated cost of launching the work was underwritten by a number of member companies, the Consumers Power Company, The American Light & Traction Company, The Detroit Edison Company and the Semet-Solvay Engineering Corporation.

The Michigan fellowship has attacked many difficult problems in the past. The first one dates back to the days when gas was still the most important lighting medium. Work was undertaken on lighting with incandescent mantles. A three-year study on the removal of naphthalene followed, after which the fellowship took up the subject of coal gas manufacture. Case hardening, the weathering of coal, gas in japanning and treatment of brass, complete gasification, use of oxygen in gas producers, instantaneous carbonization and ammonium sulphate production and disposal followed.

The matter of the research fund and the appointment of Mr. Pettyjohn as investigator will come formally before the regents for acceptance and approval at their December meeting.

The fellowship committee of the Michigan Gas Association is as follows:

Chairman, James A. Brown, Jackson; Chairman, John W. Batten, Detroit; Dan W.



FLUOR
Cooling Towers
In The Compressor Station

Whether gas is to be pumped from the Panhandle to Kansas City, from Ventura to Los Angeles, or back to the oil sand, a Fluor tower is the economical answer to the cooling problem.

Fluor Redwood Cooling Towers are rapidly becoming standard equipment for large main line stations as well as for small gas lift plants.

Descriptive Catalog on Request

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FLUOR
REDWOOD
COOLING TOWERS

The STRICKLER
Ratchet Pipe Cutter

The STRICKLER Ratchet Pipe Cutter automatically cuts cast iron, steel and wrought iron pipe (from 1½ to 30" in diameter) by hand (either in the trench or in the shop).

You can cut any pipe from any position easily. Simply pump the handle and the STRICKLER does the rest. Order your STRICKLER Now

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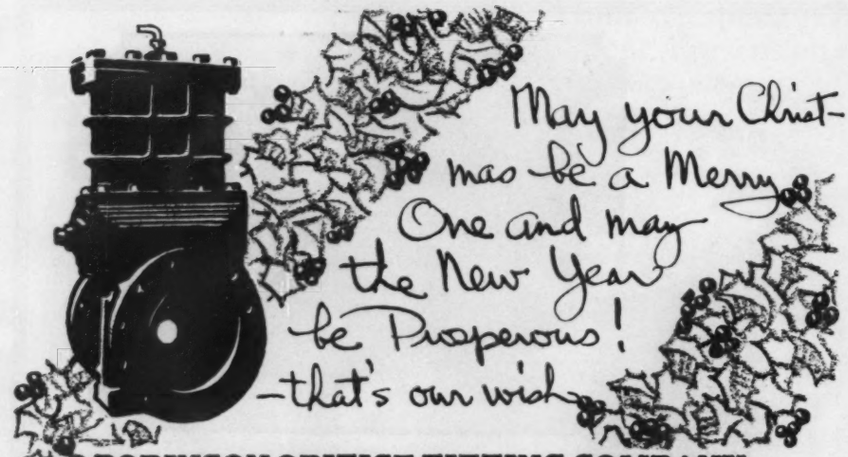

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Stockton
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FIRE BRICK, INSULATING BRICK
HIGH TEMPERATURE CEMENT

High Grade Refractories
for
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Stockton,
California

Hayes, Port Huron; Charles R. Henderson, Ann Arbor; Fred W. Seymour, Battle Creek, and Frank W. Steere of New York.

GAS ACREAGE IN OKLAHOMA BOUGHT BY NO. COUNTIES

The Northern Counties Gas Company of Ponca City, Okla., purchased a solid block of approximately 1400 acres in northeastern Grant County, Oklahoma, from the Marland Oil Company early in November. This territory is considered excellent for potential gas supply, and lies to the north of the old Deer Creek field. Marland, according to the deal, retains the oil rights on the land. The purchasers were due to start a gas test well following the acquisition of the gas rights on the land.

"DRY ICE" FROM CARBON DIOXIDE GAS

Continental Oil Company has developed a 40,000,000 cubic foot flow of carbon dioxide gas from a well on the McCallum structure in Northern Colorado, and is considering erecting a $150,000 refrigeration plant to manufacture a product known as "dry ice," useful in refrigerating transcontinental railway cars, from the gas.

BATON ROUGE LINE

A welded steel high pressure gas line extension in Baton Rouge, La., of eight-inch belt line and six-inch main, together amounting to some $66,000 in cost, is a project of the Baton Rouge Electric Company, necessitated by taking on many industrial consumers following recent introduction of natural gas.

RUSH WORK ON DIXIE LINE

Eighty miles of the Dixie Gulf Gas Company gas line from Waskom field, near Shreveport, to Port Arthur and Houston had been completed, together with completion of two major river crossings on November 6. The remainder of the line is expected to be laid more rapidly, as the sections completed comprise most of the difficult part of the route of the line.

ST. JOSEPH EXTENSIONS

Gas mains are to be extended into the Hyde Park section of St. Joseph, Mo., by the St. Joseph Gas Company, which brings gas to the last large district of the city now without service.

DEFINES QUALIFICATIONS OF SAFETY DIRECTOR

Speaking before the public utilities section ot the National Safety Council Congress at Chicago, Charles B. Scott of the Chicago Bureau of Safety defined the qualifications which the successful safety director must possess as follows:

"He must be interested in and pleased with his work. He must be sincere and have faith in the results to be accomplished. He must have those qualities of heart, mind and conduct that insure respect and influence. He should have an appreciation of the relationship between his and the operating departments, and possess the tactfulness to overcome the difficulties presented by this relationship. He must know human nature and understand the work he is trying to make safe. These essentials, supplemented by diligence, patience, study and hard work will develop a most efficient safety director, save the lives of workers, and make him and them better and happier."

ALLEN WITH BABCOCK

E. Glen Allen has recently joined the sales organization of the C. B. Babcock Company, manufacturers' represen atives, San Francisco and Los Angeles. Allen will cover the Northern California territory, filling the opening created by the resignation of Wynant Van Zandt. Formerly in the employ of Eastman Pollard Company, Oakland, Allen has been selling electrical refrigerators, for two years in the Bay region, and more recently in Los Angeles, where he was manager of the Los Angeles branch of the Oakland house.

WORK RUSHED ON GAS LINE TO OKLAHOMA CITY

Two pipe line crews are rushing work on the Oklahoma Natural Gas Company's new 16-inch gas line scheduled to run 36 miles, from the Norge compressor station near Chicasha, Okla., to a point several miles south of Oklahoma City, across the Sou h Canadian River. The total expenditure is estimated at $500,000. The line will deliver 50,000,000 feet of gas daily, fuel for Oklahoma City. From the South Canadian River the gas will be moved into Oklahoma City by two 12-inch lines already laid. Twelve miles of the new line is now complete, and the entire contract is slated to be completed early in December.

NEW FACTORY FOR SUPERBO

A new factory building has recently been completed in Vernon, Los Angeles industrial section, to house the activities of Superbo Mfg. Company, manufacturers of Superbo Automatic-Storage Water Heaters.

The old factory in which Superbo's have been built since 1914 recently suffered loss by fire, necessitating a new and larger factory building.

Superbo burners, according to Julius Brombacher, president of Superbo Mfg. Company, will in the future be constructed without screens, which change is incorporated in late patents granted the company on burner construction.

The Superbo heater has recently received the American Gas Association's "Blue Star."

ALAMEDA COUNTY GAS CO. IN PETITION TO COMMISSION

Alameda County Gas Company has applied to the California Railroad Commission for a certificate of public convenience and necessity to exercise a franchise granted by the Board of Supervisors of Alameda County to operate a gas utility in Mt. Eden, Alvarado, Centerville, Newark, Niles, Irvington, Warm Springs, Mission San Jose, Decoto, and contiguous territory in Alameda County. Applicant also requests authority to issue and sell $296,101 of its capital stock, and $285,000 of first mortgage six per cent bonds to finance the project.

UTILITIES SECRETARIES TO CONVENE IN OKLA. CITY

Acceptances from public utility association secretaries of invitations to attend the national conference to be held in Oklahoma City, December 5, 6 and 7, have been received from all sections of the country, from New York to California, according to E. F. McKay, secretary of the Association of Utility Secretaries. The program of the secretaries' convention will include methods of handling conventions and other projects in which the various branches of the public utility industry have a common interest.

Protected Pipe is a *Necessity!*

PIONEER PRODUCTS

PIONEER RUBBERTEX is a coating for exposed metal surfaces in conjunction with Pioneer Pipe Covering ▾ ▾ ▾ it resists alkaline erosion, stops oxidation, overcomes electrolysis. Even when frozen it will not chip, scale or crack!

Modern engineering practice demands protection for pipe-lines ▾ ▾ ▾ an asphalt saturated fabric covering to resist earth erosion and corrosion, where buried ▾ ▾ ▾ and to resist oxidation, where exposed.

Long periods of research plus the results from actual usage have proved the practical and profit-making qualities of Pioneer Pipe Covering.

Pioneer originated this method of spirally wrapped pipe covering ▾ ▾ ▾ and the original product is still the best pipe-line protection.

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Established 1888
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PIPE COVERING

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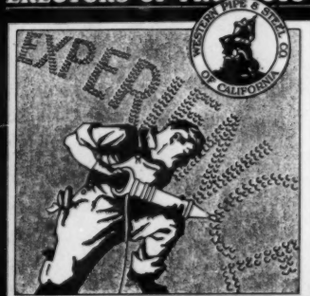
DESIGNERS, FABRICATORS & ERECTORS OF PRODUCTS OF STEEL



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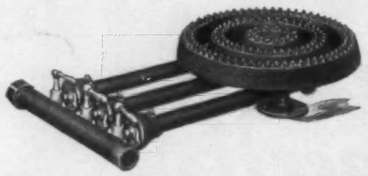

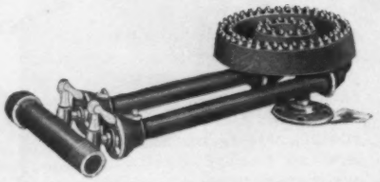

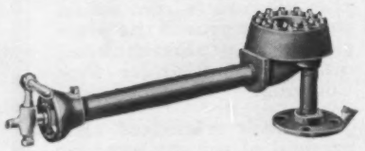

A New

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Ring Burner

The new 40-ABC Ring Burner is a highly-improved triple atmospheric burner. Made up of three independent burners which may be used singly, in pairs, or in triple. Improved design insures greater efficiency and longer life. Write to us and we will gladly send you some very interesting details concerning the new 40-ABC.

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Keep Your Cooling Towers Free of Algae

MAAS ALGA - CIDE does not precipitate with any kind of water—a distinct advantage over most fungicides.

MAAS ALGA - CIDE was developed through extensive research and experimental work in the Maas Laboratories. Exacting tests have proved it unusually effective in preventing the growth of algae.

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SOUTH CHESTER STEEL PIPE

Excels for Gas Service

The unusual care given to accuracy of diameter and welding qualities, makes Chester Pipe a favorite for gas lines.

SOUTH CHESTER TUBE CO.
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NATURAL GAS BONDS ARE POPULAR INVESTMENT

Natural gas financing has taken on large proportions in the past year or two, indicating a corresponding popularity of natural gas bonds. This is the conclusion arrived at by Freeman, Smith & Camp Company, bankers, who recently issued a special bulletin on natural gas company bonds. According to this bulletin $123,728,000 of the amount of natural gas bonds outstanding has been issued since January 1, 1926. Quoting the bulletin further, it reports that out of $264,500,792 natural gas bonds issued since 1900 only $148,314,840 remain outstanding, and of the latter amount only $10,702,840 has been outstanding more than 10 years.

KANSAS UTILITY EMPLOYEES ARE FORCED TO SAVE

A utility company in Kansas has recently taken the position that every employee, in order to remain in the company's service, must save at least 10 per cent of his pay. The employee is asked to fill out a card each month showing how his savings are made. Savings acceptable to the company include installments on stock purchases, savings bank deposits, building and loan payments, life insurance premiums, payments on homes, and other similarly worthy methods of saving. The rule is enforced on the theory that the man who is careful about his own affairs will be careful of the company's interests also. Payments on automobiles for pleasure are not acceptable savings according to the company in question.

PIONEER GAS MAN DIES AT MUNROE, LA.

P. R. Reardon, Monroe, La., died on November 25, at the age of 76. The deceased was one of the pioneers of the gas and carbon black industries, having built the first carbon black plant to use natural gas at Ludlow, Pa., and having built a number of plants in Indiana, West Virginia, and Louisiana. Surviving are his widow and two sons, H. H. Reardon, general superintendent of the Columbian Carbon Company at Monroe, La., and W. E. Reardon, associated with the same company.

ONE OUT OF SEVEN HAS OKLAHOMA STOCK

One out of every seven customers of the Oklahoma Gas & Electric Company owns one or more shares of the utility's preferred stock, according to a recent company statement.

UTILITY GROWTH FASTEST

The public utilities of the United States, not including the steam railroads, are growing faster than any other line of business. The record of money invested in utilities during the first seven months of 1927 shows a total of $1,600,000,000, or about 38 per cent of all the financing in the Nation.

The nearest approach to this demand for money for extensions and improvements in the same period was on the part of the steam railroads, which totaled $363,000,000.

OKLAHOMA FRANCHISES GIVEN COMMUNITY NATURAL

Lexington and Wayne, Oklahoma, have recently granted gas franchises to the Community Natural Gas Company, which is now completing new gas distribution systems in other Oklahoma towns. The Community Natural is extending its gas mains at Wynnewood, making installation of a regulator station there.

SURVEY OF COAL STOCKS

Consumers' stocks of bituminous coal amounted to 61,900,000 tons on October 1, according to a survey just completed by the United States Bureau of Mines, Department of Commerce. In comparison with the final revised figure for July 1,—63,400,000 tons—this is a decrease of 1,500,000 tons. On October 1, 1926, the stocks were 43,000,000 tons.

Exports during the third quarter of the year were normal, averaging 351,000 tons a week. Home consumption averaged 8,360,000 tons, as against 9,050,000 tons in the same period last year, the decrease of 7.6 per cent reflecting diminished activity in the steel, automobile and other industries. With colder weather, however, the weekly consumption tends to increase and in the last quarter of 1926 it averaged 11,200,000 tons.

GAS FURNACE ASSN. MOVES

The Gas Furnace Association of Southern California, is moving its headquarters office from the Los Angeles Gas and Electric Corporation Building at Eighth and Flower Streets to the Builder's Exchange Building, 656 South Los Angeles Street, effective December 1.

INVESTMENT FIRM REPORTS FAVORABLY ON NATURAL GAS

Robert C. Taylor's New York firm of investment bankers reports following a recent survey that more than $1,500,000,000 is invested in the production and distribution of natural gas. The report says that the public is annually buying 1,188,539,000,000 cubic feet annually at a cost of $265,184,000. The report goes into history of the industry to show that the first natural gas company was organized in 1865, with major developments transpiring after 1902.

STOCKTON FIREBRICK MOVES

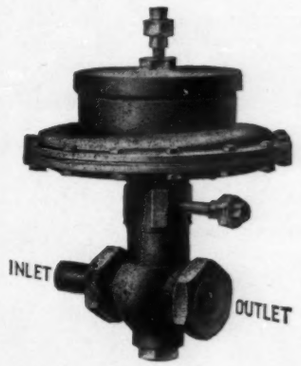
The San Francisco offices of the Stockton Firebrick Company have been moved from the Rialto building, to a large suite in the new Russ building, on the 12th floor. John Kennedy, formerly of the Celite Products Company, in the San Francisco office, has joined the force of the Stockton organization as a sales engineer.

CUSTOMER OWNERSHIP IN MISSOURI

There are 66,746 customers of public utilities in Missouri who have purchased stock and securities in the utilities aggregating more than $193,000,000, according to a survey recently completed by The Missouri Committee on Public Utility Information. The investors own an average of 29 shares of stock each, having a par value of $100 per share.

NATURAL GASOLINE GAINS

Natural-gas gasoline production gained in September, 1927, the total output amounting to 136,300,000 gallons, a daily average of 4,540,000 gallons. This is an increase over the daily average of the previous month of 190,000 gallons, and over the previous high record of April, 1927, of 100,000 gallons. The rise in output was largely due to increased California and Seminole plant production. Stocks of natural-gas gasoline at the plants again showed a material decline, there being 30,899,000 gallons on hand September 30, 1927, as against 35,516,000 gallons (revised figures) on hand the previous month.



Fulton Dead Weight Governor

An unusually sensitive, frictionless and long-lasting governor to be used either as a direct governor, or for individual service. Maintains a uniform pressure throughout the entire range of flow.

WRITE for the Chaplin-Fulton 60-page catalog! It's free and contains data on our many time-tested and proven gas regulators that you will find invaluable in your work.

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Organized 1884—Oldest Builders of Gas Regulators in the Country. Built in all Sizes, From 1 Inch to 24 Inches; For All Service. 1 oz. up to 1,600 lbs. Pressure to Square Inch.

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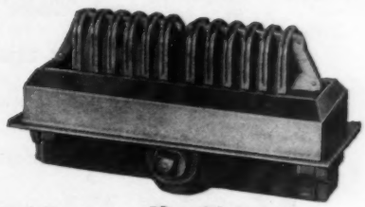
No. 6



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5720 Long Beach Avenue Los Angeles, California

KEY *Special* PIPE JOINT COMPOUND

Water-Proof

KEY SPECIAL PIPE JOINT COMPOUND will effectively seal screw thread and gasket joints for such service as Gas, Water, Steam, Compressed Air, etc.

One of the many advantages this compound has over the commonly used red leads and oils, etc., is that the pigment will not settle to the bottom of the container, thereby holding the contents in equal suspension at all times ready for service.

KEY SPECIAL PIPE COMPOUND is not a quick hardening cement but a plastic lubricant and filler that will seal the most obstinate joint with ease.

You may test the high quality of this product by taking a small quantity between the fingers which will immediately demonstrate the wonderful lubricating qualities along with the "pull or drag" that makes possible a permanent seal without resorting to cementing materials, most of which are very undesirable and impracticable to use.

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The Magic Way Company

Gas Heating Devices

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I. B. Funk

NEW FIRM ENTERS FIELD OF GASOLINE EQUIPMENT MFG.

A new firm entering the manufacturing of absorption plant and refinery equipment is the Engineering, Research and Equipment Company, 655 Roosevelt building, Los Angeles. The organizers, men well known in the industry, are I. B. Funk, consulting engineer; J. E. Kobernik, formerly general manager of the Newton Process Manufacturing Company; and P. M. Raigorodsky, formerly efficiency engineer for Newton Process Manufacturing Company.

I. B. Funk is vice-president of the California Natural Gasoline Association, and has been connected with the natural gasoline, gas and petroleum industries for the past twenty-five years. During seven and one-half years with the Union Oil Company of California, he had, for six years, charge of the research work pertaining to gasoline plants and field operations. Since leaving the Union Oil Company in 1926, he has been engaged in consulting engineering practice.

J. E. Kobernik came to California during the World War and entered the employ of the General Petroleum Corporation in charge of shops; then went to the Standard Oil Company in charge of shops. In 1922 he started the Santa Fe Springs Welding and Boiler Shop, which was later incorporated as the Newton Process Manufacturing Company. Mr. Kobernik had charge of the design and manufacture of the Newton equipment, and resigned as general manager to become identified with the Engineering Research and Equipment Company as general manager.

P. M. Raigorodsky received his training at the University of Prague, graduating from the University of Texas. He has had extensive experience in the supervision and operation of gasoline absorption plants and efficiency work.

The new firm is equipped to handle consulting, research, design and valuation engineering work, and according to the organizers, will manufacture Kora stills, interchangers, absorbers, Funk fractionating, cooling and condensing equipment and a complete line of absorption plant and refinery equipment. The manufacturers will contract plants complete and ready to use and their equipment will be manufactured both in Los Angeles and Tulsa, Oklahoma.

Status *of* Valuation *for* Rate Making

(Continued from Page 22)

Investment" theory of a "rate base" will have any standing in future proceedings of the Supreme Court of the United States in rate litigation, it must follow that regulatory commissions using them in the future will be subject to reversal on appeal. The advocates of these fallacies have not, however, given up the fight. There is considerable agitation in the public press for legislation designed to restore their legal standing—legislation that would give the property of public utilities a different status and place it outside the protection that the law now extends to all private property. Such legislation is repugnant to both the letter and the spirit of our constitution, and, in view of the Indianapolis decision, will most likely be given but scant consideration by the courts.

The public utility is essential and distinctly a part of the community in which it operates. Its service is a vital element in communal activities, its prosperity is wholly dependent upon that of the community, and its property is inseparably associated with that of all other industries, enterprises and personalities that make up the sum total of community personnel. To deny that utility an equality of status before the law of its relationship with other community interests and enterprises, to refuse to its property an equality of protection by the law with the property of other community enterprises, would destroy the basic equality upon which constitutional democracy is predicated, and with its foundation thus weakened, no governmental structure of enduring strength or stability could be erected or maintained upon it.

In my opinion appraisals of property have been accorded an exaggerated importance in the solution of utility problems during recent years, and there are reasons for believing that a saner conception of their usefulness is at hand. They are not a sound basis for the fixing of rates, although they are an important factor in defining the minimum level of permissible rates. If a regulatory body should prescribe rates too low to produce a fair return, it is, of course, essential that evidence be presented as to the fair value of the property in the court proceedings instituted to test the validity of the rates so prescribed. But the courts are clearing their dockets of utility rate cases and fewer new ones are being filed. Many state regulatory commissions have announced their adherance to the rule laid down in the Indianapolis case.

There are many indications that the popular attitude toward utility enterprises is undergoing a change that we may hope will be reflected in the personnel and the policies of regulatory agencies throughout the Republic. There is a noticeable tendency on the part of the general public to concede the fundamental fact that, inasmuch as utilities are equally subject to the laws of economics, they are, in equity, entitled to the same equality before the civil law, as all other commercial enterprises. The Indianapolis Water Case decision, in confirming that principle as a legal right, gave it a wider and more enduring recognition. The regulation of utility rates in the future must, in conformity to this decision, follow more closely the principles of economics than has characterized some of the proceedings in the past, and we may expect that the value of the service rendered by utilities will again

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be given the consideration to which it is justly entitled. We may, indeed, cherish the hope that the spirit of toleration and of co-operation that is becoming so general in the business and professional world will extend to the domain of regulation, that utility service may come to be regarded as one of the primary sources of community wealth and of community prosperity, and that regulation may, in the future, have for its primary object that of securing for the community the maximum of value that can be created by or obtained from it, rather than an arbitrary minimum of cost for a service less extensive or less completely utilized by the community served. When this time comes the appraisals of property will be relegated to a position of much less importance than has been given them in the past.

TEXAS CORP. ASKS CONTRACT TO SERVE OMAHA

The Texas Corporation is bidding for a contract to serve Omaha, Nebraska, with natural gas, to be piped from the Texas Panhandle. The proposed line will cost in the neighborhood of $40,000,000, estimates indicate.

SEMINOLE GASOLINE OUTPUT RUNS TO 17% OF TOTAL

Recent check of the natural gasoline production in the Seminole, Oklahoma, field, showed the daily average to be runnning 760,000 gallons, about 17 per cent of the entire amount produced in the United States. This run is continually increasing, and by the close of the year is expected to exceed 800,000 gallons daily.

GASOLINE PLANT ON GAS LIFT

The Texas Corporation's new absorption plant in the Pine Island district of Caddo Parish, Louisiana, has a capacity of 20,000,000 feet of gas daily, but is now running only about 12,000,000 feet, and getting around a half gallon per 1000 feet. The gas is coming from the Trinity deep sand field in connection with the recently installed gas lift system.

O. G. & E. AND FT. SMITH UTILITY IN MEETING

On November 21 and 22 the Oklahoma Gas & Electric Company and the Ft. Smith Light and Traction Company held their fourth annual conference, at the Skirvin Hotel, Oklahoma City. Executives and representatives from the various properties were present to take part in the two-day program, which was designed to contribute to improvement of service on the companies' systems.

GAS HOLDERS TO SERVE AS AIR GUIDES

The use of gas holders as land guides for aviators has received the official approval of the American Gas Association. More than 1500 gas companies are prepared to mark their holders, numbering 2500, with arrows, or other suitable direction signs, following the lead already set by several companies. Signs on gas holders may be easily read at an altitude of 2500 feet, and under good flying conditions can be read without trouble at 10,000 feet, says the A. G. A., on the basis of tests made. Tops of the holders can be illuminated at night to aid night flying.

Gas companies will in all probability follow the specifications laid down by the U. S. Department of Commerce in signing their holders.

Empire Men Show Gas Line *to* Editors

FIFTEEN newspaper guests from Kansas, Nebraska, Missouri and Texas and a dozen more officials and representatives of Cities Service Gas Company, Gas Service Company and the Kansas City Gas Company made a four-day inspection tour of the Cities Service Gas Company's big 20-inch natural gas pipe line November 13 to 16, from the Texas "panhandle" to Wichita, Kansas, where it ties in with the main line system of the Cities Service Gas Company.

The party, which was under the supervision of A. J. Foster, of Henry L. Doherty & Company, New York; Major T. J. Strickler, vice-president and general manager Kansas City Gas Company, Kansas City, Mo.; J. W. Finley, chief counsel, Empire Companies; Keith Clevenger, director of Information Service, Empire Companies; N. D. Holman, valuation engineer, Empire Companies, all of Bartlesville, and other representatives of the Cities Service Companies, left Kansas City Sunday morning, November 13th, traveling over the Santa Fe in special Pullmans, to Amarillo, Texas, from which point the inspection tour started.

Two days were given over to the inspection of compressor stations at Pampa, Texas; Mooreland, Oklahoma and Wichita, Kansas; the huge Burk Burnett Four six (6666) ranch gas reserve controlled by the Empire and Cities Service Gas Company; the various phases of pipe line construction; the river crossings at the North Canadian and Cimarron rivers; dinner at a pipe line camp near Kiowa, Kansas, winding up the actual inspection trip on Tuesday evening, November 15, with a dinner at the Lassen Hotel, Wichita, at which ex-governor Henry J. Allen, editor of the Wichita Beacon, officiated as toastmaster.

TRIBUTES PAID ON P. G. AND E. OFFICE ARCHITECTURE

The general office building of the Pacific Gas and Electric Company at Market and Beal Streets, San Francisco, has recently been awarded two certificates of honor by the Northern California Chapter of the American Institute of Architects. The awards were received for merit in design and execution of architecture, reflecting considerable credit upon the engineering department of the P. G. and E., which managed all the work in connection with the erection of the building.

A. P. I. EIGHTH SESSION TO INTEREST GASOLINE MEN

On December 5, 6, 7 and 8 the American Petroleum Institute holds its eighth annual convention, this year at the Stevens Hotel, Chicago. Several of the convention features will hold interest for gas men and the natural gasoline industry.

At 10:00 a.m. on December 8 a group meeting on the general topic of natural gasoline will be held, the program being arranged by the Natural Gasoline Association of America which is co-operating with the A. P. I. in staging this group session.

On the program for the natural gasoline group will appear the following:

"Economics of the Natural Gasoline Industry," Dr. E. R. Lederer, Texas & Pacific Coal and Oil Company.

"Vapor Pressures of Natural Gasoline," G. G. Oberfell, Phillips Petroleum Company.

"Natural Gasoline as a Chemical Material," Emby Kaye, Skelly Oil Company.

General Discussion.

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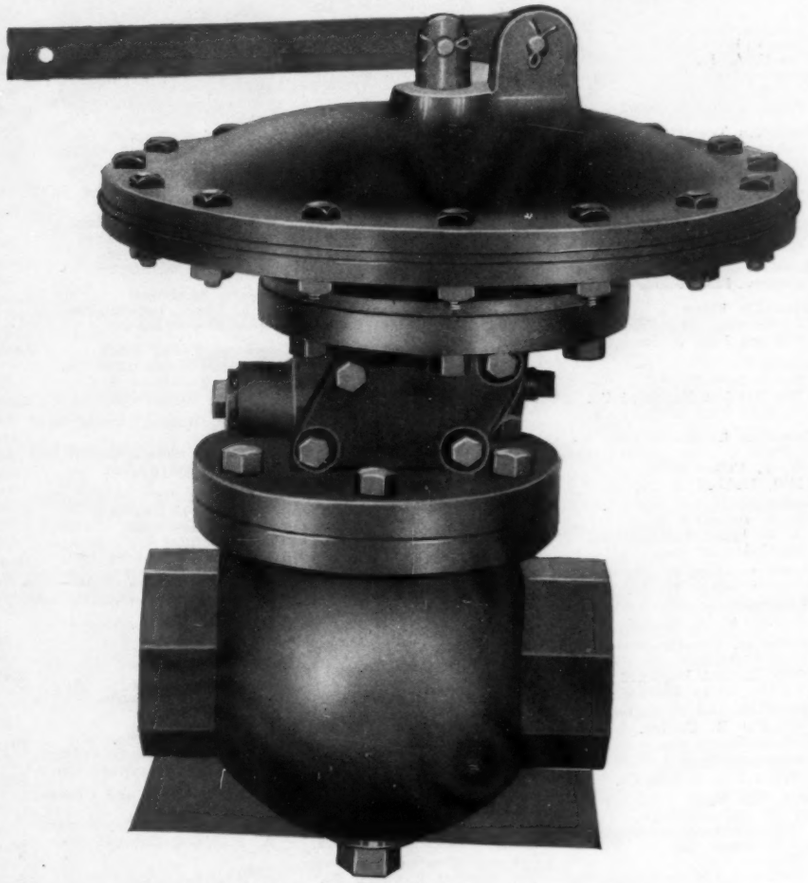

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Readers interested in any articles not listed in these pages are cordially invited to advise *Western Gas* of their wants and every effort will be made to furnish a list of the proper manufacturers. Addresses of companies listed on these pages may be found by consulting their advertisements in this issue.

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Baker Iron Works.
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Fluor Construction Co.
Jackson Engr. & Equip. Co.
Jensen Instrument Co.
The E. A. Key Company
Southwestern Engineering Corp.
Western Pipe & Steel Co.

Absorption Towers
Baker Iron Works.
C. F. Braun & Co.
J. A. Campbell.
Southwestern Engineering Corp.
Semet-Solvay Engr. Corpn.
Western Pipe & Steel Co.

Abrasives
Abrasive Engineering Corp'n.

Adjustable Plugs
Lattimer-Stevens Co.
Western Pipe & Steel Co.

Agitators
Baker Iron Works.
The Bartlett Hayward Co.
Western Pipe & Steel Co.

Aluminum Bronze Powder for Paint
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Hill, Hubbell & Co.

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C. F Braun & Co.
A. R. Maas, Laboratories.
Smith-Emery Co.

Annealers (Bar, Blank, Strip)
Pacific Meter Works.

Anti-Fluctuators
Pacific Meter Works.

Apparatus, Experimental Gas
The Alpha-Lux Co., Inc.
The Bartlett Hayward Co.
Pacific Meter Works.

Appraisals and Valuations
Charles R. Collins.
Smith-Emery Co.

Automobile Tires
Truck Tire Service Co.

Bags, Gas Main
C. B. Babcock Co.
Connelly Iron Sponge & Governor Co.
Mueller Co.
Safety Gas Main Stopper Co.
Semet-Solvey Engr. Corpn.

Barometers
Jensen Instrument Co.
Westcott & Greis, Inc.

Bench Iron Work
The Bartlett Hayward Co.
General Gas Light Co.

Blast Gates
Montague Pipe & Steel Co.
Semet-Solvay Engr. Corpn.

Blocks and Tiles, Fire Clay
The Alpha-Lux Co., Inc.
American Refractories Co.
Gladding, McBean & Co.
Semet-Solvay Engr. Corpn.
Stockton Fire Brick Co.

Blowers and Boosters
Ingersoll-Rand Co.

Blowpipes
Montague Pipe & Steel Co.

Boiler—Brickwork
J. N. J. Firebrick Co.
J. T. Thorpe & Son, Inc.

Boiler Equipment
E. A. Key Co.

Boiler Maker's Tools
E. A. Key Co.

Boilers, Gas-Fired
C. B. Babcock Co.
Baker Iron Works.
Montague Pipe & Steel Co.

Boiler Settings, Pipe and Boiler Insulation
Pioneer Paper Company.
J. T. Thorpe & Son, Inc.

Boilers, Waste Heat
Baker Iron Works.
The Bartlett Hayward Co.

Boilers, Water Tube
Baker Iron Works.
Montague Pipe & Steel Co.
Southwestern Engineering Corp.
Western Pipe & Steel Co.

Boxes
Baker Iron Works.
Semet-Solvay Engr. Corpn.

Brass (rods, sheets, tubes, wire)
Mueller Co.

Breakers
Ingersoll-Rand Co.

Breeching (Boiler and Stack)
The Bartlett Hayward Co.
Western Pipe & Steel Co.

Brick, Firebrick
Abrasive Engineering Corp'n.
The Alpha-Lux Co., Inc.
American Refractories Co.
Gladding, McBean & Co.
Semet-Solvay Engr. Corpn.
Stockton Fire Brick Co.

Brick, Firebrick—Installation
J. N. J. Firebrick Co.
J. T. Thorpe & Son, Inc.

Brushes, Wire Pneumatic
Abrasive Engineering Corp'n.
Ingersoll-Rand Co.

Buildings, Steel
Baker Iron Works.
Western Pipe & Steel Co.

Bunkers, Steel and Concrete
The Bartlett Hayward Co.
Western Pipe & Steel Co.

Burners, High Pressure
Lee B. Mettler.
Rotary Manufacturing Co.

Burners, Low Pressure
C. B Babcock Co.
The Bartlett Hayward Co.
General Gas Light Co.
Johnson Gas Appliance Co.
Lee B. Mettler.
Payne Furnace & Supply Co.
Rotary Manufacturing Co.
Standard Gas Equipment Corp.

Burners—Oil
Rotary Manufacturing Co.

By-product Recovery Apparatus
The Bartlett Hayward Co.
Oliver Continuous Filter Co.
Semet-Solvay Engr. Corpn.

Calorimeter Accessories
Pacific Meter Works.

Calorimeters
The Alpha-Lux Co., Inc.
Pacific Meter Works.

Cases, Meter
Pacific Meter Works.
Pittsburgh Equitable Meter Co

Casinghead, Gas Meters
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
The Foxboro Co., Inc.

Casing and Tubing (steel)
Montague Pipe & Steel Co.
Semet-Solvay Engr. Corpn.
South Chester Tube Co.

Casing—Iron
South Chester Tube Company

Cast Iron Pipe
Semet-Solvey Engr. Corpn.
United States Cast Iron Pipe and Foundry Co.

Castings
The Bartlett Hayward Co.
Semet-Solvay Engr. Corpn.
United States Cast Iron Pipe and Foundry Co.

Cement
Abrasive Engineering Corp'n.
Stockton Fire Brick Co.

Cement, High Temperature
Stockton Fire Brick Co.

Cement—Plastic
Pioneer Paper Company.

Centrifugal Pipe
United States Cast Iron Pipe and Foundry Co.

Charging Machines (retort, etc)
The Bartlett Hayward Co.
Semet-Solvay Engr. Corpn.

Checker Brick
Abrasive Engineering Corp'n.
American Refractories Co.
Gladding, McBean & Co.
Semet-Solvay Engr. Corpn.
Stockton Fire Brick Co.

Chemical and Gas Testing Apparatus
The Alpha-Lux Co., Inc.
Pacific Meter Works.
Stauffer Chemical Co.
Westcott & Greis, Inc.

Chemists, Analytical
A. R. Maas, Laboratories.
Smith-Emery Co.

Chimneys, Radial Brick
American Refractories Co.
Gladding, McBean & Co.
Stockton Fire Brick Co.

Chimneys, Radial Brick Installation
J. N. J. Firebrick Co.
J. T. Thorpe & Son, Inc.

Chutes (coal, coke, ash)
The Bartlett Hayward Co.
Semet-Solvay Engr. Corpn.
United States Cast Iron Pipe and Foundry Co.

Clamps and Sleeves, Pipe
Mueller Co.

Clamps, Service
Mueller Co.

Cleaners, Service
C. B. Babcock Co.
Pacific Meter Works.

Coal Gas Plants
Charles R. Collins.
Semet-Solvay Engr. Corpn.
The Bartlett Hayward Co.

Coal Tar Products and Chemicals
W. P. Fuller & Co.
A. R. Maas, Laboratories.

Cocks
C. B. Babcock Co.
Johnson Gas Appliance Co.
Lattimer-Stevens Co.
Merco Nordstrom Valve Co.
Mueller Co.
Geo. D. Roper Corporation.

Collectors, Dust
Western Pipe & Steel Co.
Semet-Solvay Engr. Corpn.

Compressors, Air
The C. & G. Cooper Co.
Ingersoll-Rand Co.
Oliver Continuous Filter Co.

Compressors, Gas
The C. & G. Cooper Co.
Ingersoll-Rand Co.

Compressors, High Pressure
The C. & G. Cooper Co.
Ingersoll-Rand Co.

Compressors, Portable
Ingersoll-Rand Co.

Condensers
Baker Iron Works.
The Bartlett Hayward Co.
C. F. Braun & Co.
Ingersoll-Rand Co.
Southwestern Engineering Corp.
Semet-Solvay Engr. Corpn.

Condenser Boxes
Baker Iron Works.

Condenser Tubes
Semet-Solvay Engr. Corpn.

Controllers
Jensen Instrument Co.
The Foxboro Co., Inc.

Controlling Devices, Electric
L. R. Teeple Co.

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Jensen Instrument Co.
The Bartlett Hayward Co.
C. F. Braun & Co.
The Foxboro Co., Inc.
L. R. Teeple Co.

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The Bartlett Hayward Co.
Semet-Solvay Engr. Corpn.

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C. F. Braun & Co.
J. A. Campbell
Fluor Construction Co.
J. B. Gill Corporation.
Jackson Engr. & Equip. Co.
Southwestern Engineering Corp.
Semet-Solvay Engr. Corpn.

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Jensen Instrument Co.

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The Bartlett Hayward Co.

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Pacific Meter Works.

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Ingersoll-Rand Co.

Cutters, Pavement
Ingersoll-Rand Co.

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Semet-Solvay Engr. Corpn.

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J. A. Campbell
Southwestern Engineering Corp.
Semet-Solvey Engr. Corpn.
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Diaphragms, Meter
Chaplin-Fulton Mfg. Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co

Diggers, Clay
Ingersoll-Rand Co.

Discharging Machines (retort, etc)
The Bartlett Hayward Co.
Semet-Solvay Engr. Corpn.

Displacement System, Tar
Semet-Solvey Engr. Corpn.

Door, Clean-out
Baker Iron Works.
Semet-Solvay Engr. Corpn.

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Mueller Co.

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South Chester Tube Company

Drill Pipe—Steel
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Smith-Emery Co.
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Engines, Gas
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Pioneer Paper Company.

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Pacific Gas Heating Co.
Geo. D. Roper Corporation.
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Furnaces, Floor
Payne Furnace & Supply Co.
Pacific Gas Heating Co.

Furnaces, Lead Melting
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The Estate Stove Co.
Johnson Gas Appliance Co.
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"I am identified with oil company, pipe line department, but am always interested in gas as a fuel; and also methods of measuring and natural gasoline manufacturing."—*Roy Willcockson,* Supt. Pipe Line, Continental Oil Co., Sapulpa, Okla.

"It is a very instructive, interesting magazine, and the very thing for our Company library and the employees."—*L. H. Dell,* Supervisor of Employees, So. Calif. Gas Co., Los Angeles.

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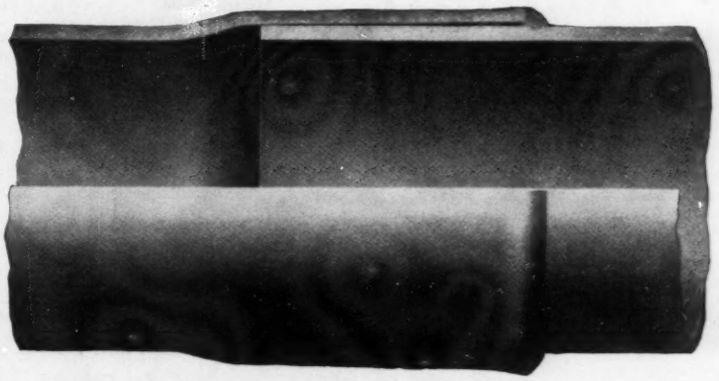

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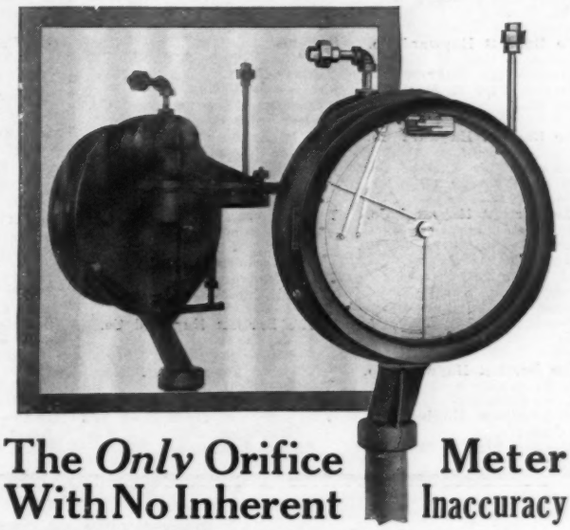

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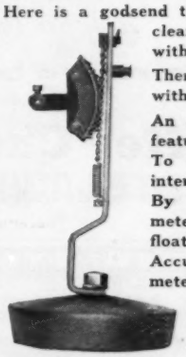

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Yes Virginia~

MANY years ago little Virginia O'Hanlon, of New York City, wrote to the editor of the Sun, of that city, asking if there is a Santa Claus. We believe there is—and to furnish the proof we quote Virginia's letter and the world famous reply by the Sun's Editor as our Christmas message to our friends everywhere.

DEAR EDITOR—*I am 8 years old and some of my little friends say there is no Santa Claus. Papa says, "If you see it in the* SUN, *it's so." Please tell me the truth. Is there a Santa Claus?*

VIRGINIA O'HANLON

115 West Ninety-fifth Street

VIRGINIA, your little friends are wrong. They have been affected by the skepticism of a skeptical age. They do not believe except what they see. They think that nothing can be which is not comprehensible by their little minds. All minds, Virginia, whether they be men's or children's, are little in this great universe of ours. Man is a mere insect, and his intellect as compared with the boundless world about him, is measured by the intelligence capable of grasping the whole of the truth and knowledge.

Yes, Virginia, there is a Santa Claus. He exists as certainly as love and generosity and devotion exist, and you know that they abound and give to your life the highest beauty of joy. Alas! How dreary would be the world if there were no Santa Claus. It would be as dreary as if there were no Virginias. There would be no childlike faith then, no poetry, no romance, to make tolerable its existence. We should have no enjoyment except in sense and sight. The eternal light with which childhood fills the world would be extinguished.

* * * * *

Not believe in Santa Claus! You might as well not believe in fairies! You might get your papa to hire men to watch in all the chimneys on Christmas Eve to catch Santa Claus, but even if they did not see Santa Claus coming down, what would they prove? Nobody sees Santa Claus, but that is no sign that there is no Santa Claus. The most real things in the world are those that neither children nor men can see. Did you ever see fairies dancing on the lawn? Of course not, but that's no proof that they are not there. Nobody can conceive or imagine the wonders that are unseen and unseeable in the world. You may tear apart the baby's rattle and see what makes the noise inside, but there is a veil covering the unseen world which not the strongest man, nor even the united strength of all of the strongest men that ever lived, could tear apart. Only faith, fancy, poetry, love, romance can push aside that curtain and view a picture of supernal beauty and glory beyond. Is it all real? Ah, Virginia, in all this world there is nothing else real and abiding.

No Santa Claus? Thank God, he lives and he lives forever! A thousand years from now, Virginia, nay, ten times ten thousand years from now, he will continue to make glad the heart of childhood.

* * * * *

The

C. & G. COOPER COMPANY

hope that your Santa will be as good to you as our Santa has been to us—and wish you great success and joy for 1928.

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